The Electrical Industry's Weekly Magazine

March 5, 1956

Electrical World

Price 35 Cents

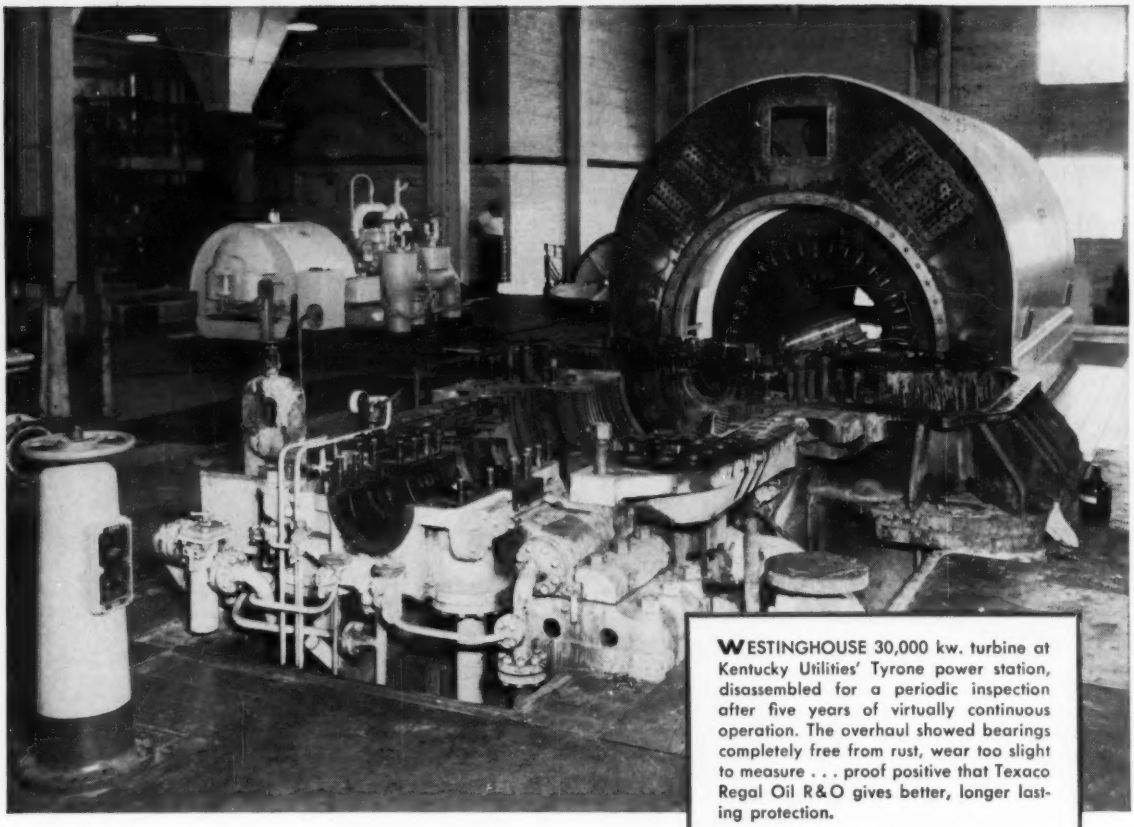
A McGraw-Hill Publication

AN INDUSTRY REPORT

Let a Power Salesman Show You How...

Electric Power Boosts Industrial Output ... Page 87

NEW IN THIS ISSUE — More Easily Read Type ... Page 71



WESTINGHOUSE 30,000 kw. turbine at Kentucky Utilities' Tyrone power station, disassembled for a periodic inspection after five years of virtually continuous operation. The overhaul showed bearings completely free from rust, wear too slight to measure . . . proof positive that Texaco Regal Oil R&O gives better, longer lasting protection.

What a Story of Protection This Overhaul Tells

Kentucky Utilities Company, Tyrone, Kentucky, for years has relied on Texaco to lubricate its turbines. Recently, the No. 1 unit—a Westinghouse 30,000 kw. generator—was disassembled for a regular check-up. Here's the inspection report from Superintendent Bryan Bunch:

"We are extremely well pleased with the condition of this unit, which has operated for 39,058 hours since last overhaul. *There was no rust or sludge . . . wear on the bearings was negligible.* All bearings will be put back into the unit just as they were removed. *Texaco Regal Oil R&O* has done a wonderful job—I can recommend it for all similar turbine installations."

Operators everywhere report similar outstanding results with *Texaco Regal Oil R&O*—the world-famous *Texaco Regal Oil made even better* by special rust- and oxidation-inhibiting additives and special processing to prevent foaming.

Throughout its extra-long service life, *Texaco Regal Oil R&O* keeps turbine systems clean, bearings fully protected, governor action smooth and instantaneous. There is a complete line of *Texaco Regal Oils R&O*. They more than meet the stringent requirements of all leading turbine builders.

Let a Texaco Lubrication Engineer give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL TURBINES

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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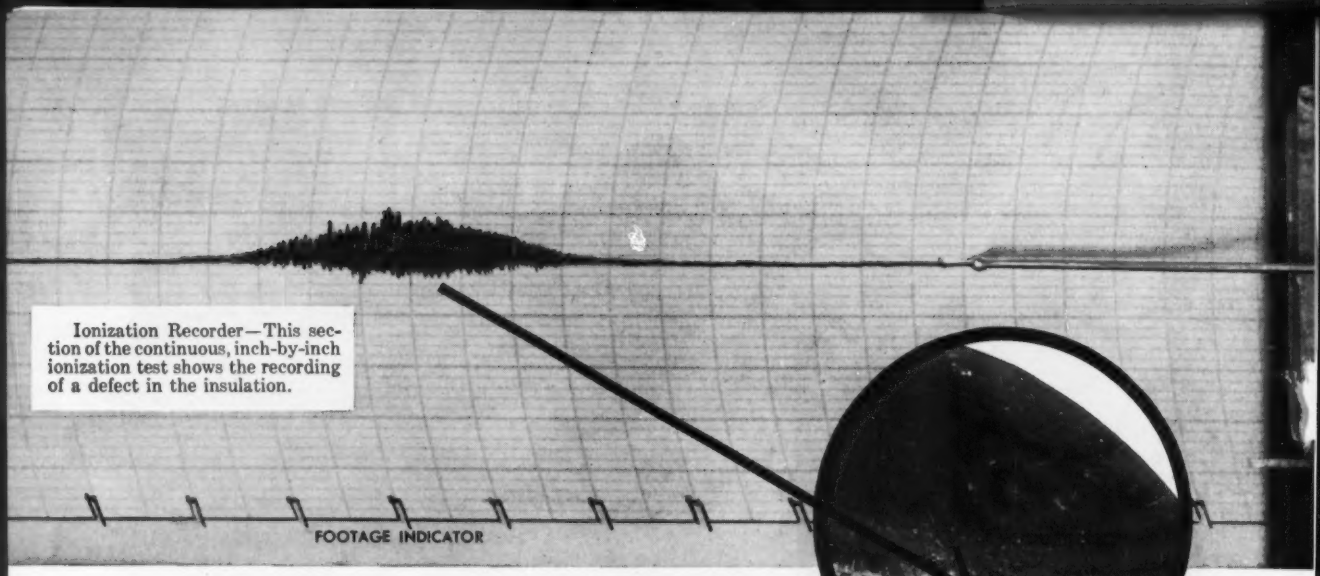


Ionization Recorder—This section of the continuous, inch-by-inch ionization test shows the recording of a defect in the insulation.

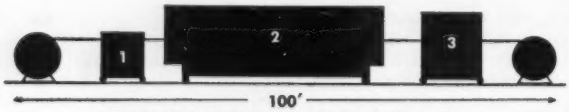
This void was detected by the "Gooding Test Train" ionization test. It was *not* detected by any of the industry's standard test procedures.

New Testing Procedure developed by Okonite

"Gooding Test Train" detects flaws in insulated power cable (4kv and over) heretofore unrevealed by standard tests

The "Gooding Test Train" has significant value to cable users. This new system of *non-destructive* testing, developed and used only by Okonite, reveals imperfections which are frequently not detected by ordinary testing procedures. Some of them even slip by Okonite's super-voltage a-c and d-c tests (highest used in the industry) and "full reel" corona tests.

The "Gooding Test Train" consists of a series of three test sets. The entire length of cable passes consecutively through each set as follows:



SCHEMATIC DRAWING OF GOODING TEST TRAIN

1. Uniformity Test—A uniformity gauge continuously checks insulation thickness—locating any thin spots which might cause premature failure.

2. Ionization Test—This is the most important unit of the "Gooding Test Train". It can measure the corona level at any spot along the cable. Procedure is to test the cable *inch-by-inch* at a predetermined voltage which is sufficient to assure the user that the corona level is at least 1½ times the rated voltage. Voids and imperfections as small as a grain of sand have thus been identified and removed.

3. X-Ray Test—X-ray inspection of the cable is performed by a 250,000 volt X-ray machine. This determines the nature and extent of any of the flaws indicated above.

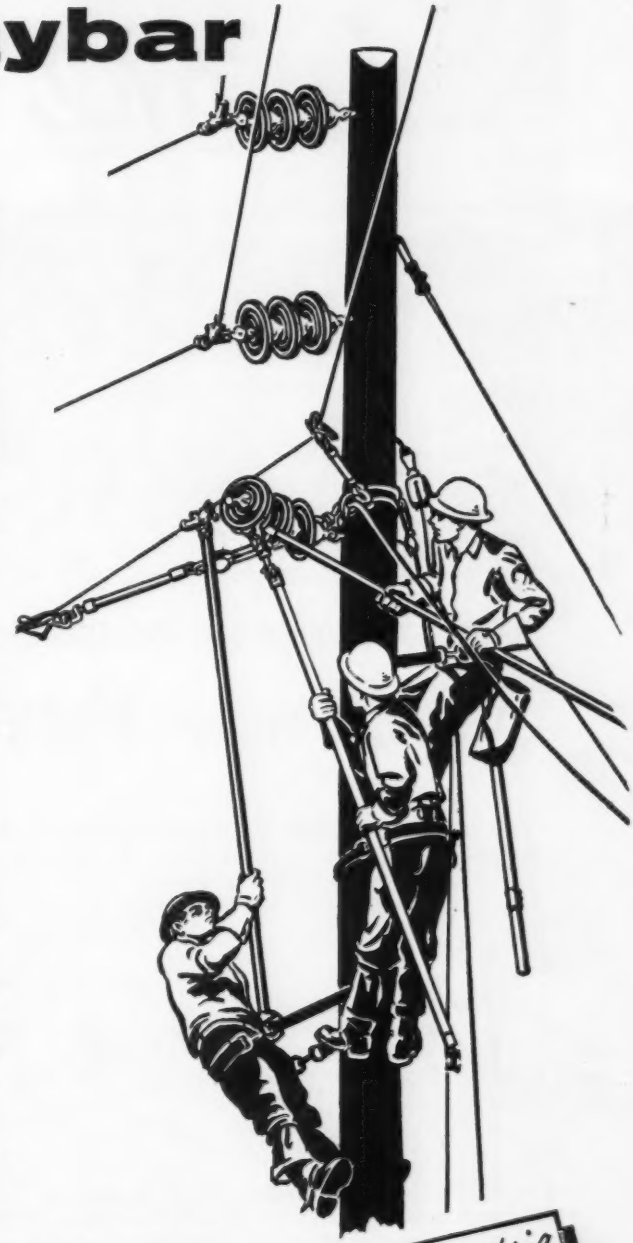
By such intensive testing, it is possible to eliminate previously unidentified imperfections that might otherwise lead to premature failure. Studies of such defects also help to identify the cause and permit preventive measures. The "Gooding Test Train" is now being used to test all Okonite's rubber-insulated cables rated at more than 4000 volts. It is a long step towards securing the "perfect cable" and, as such, of tremendous benefit to cable users.

For detailed information about Okonite's G.T.T. write for new Bulletin EW-1100, to The Okonite Company, Passaic, N. J.

3804

OKONITE SINCE 1878 *insulated cables*

HOT-LINE TOOLS and SAFETY ACCESSORIES ...via Graybar



Chance hot-line tools are products your linemen respect and use with confidence. There's a specialized Chance tool designed to do every hot-line job safely and efficiently.

Graybar can supply Chance hot-line maintenance tools individually or in sets. Incorporating the latest developments in equipment for handling energized lines, Chance tools are tested to withstand 75,000 volts per foot. Metal fittings are made of lightweight, heat-treated aluminum alloy . . . poles are laminated Sitka Spruce.

In safety accessories, Graybar distributes Salisbury protective devices of all types—rubber line hose and insulator hoods . . . rubber blankets and jackets . . . rubber coats, gloves and sleeves. All are top-quality, fully-guaranteed products made of the purest crude rubber.

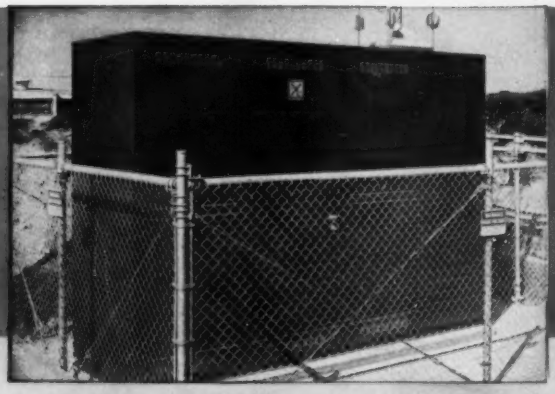
Call Graybar for all of your other pole-line needs as well. You can rely on your local Graybar Representative to provide complete, accurate information on anything you require. For special help on out-of-the-ordinary problems, feel free to ask for the assistance of your nearby Graybar Outside Construction Specialist. Graybar Electric Company, Inc., Executive Offices: Graybar Building, 420 Lexington Avenue, New York 17, N. Y.

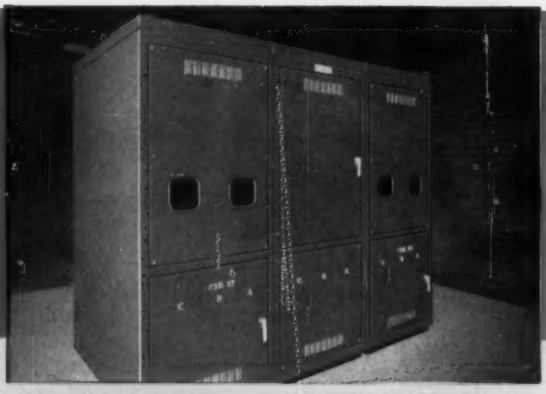
538-93

Call Graybar first for... Graybar Everything Electrical

IN OVER 130 PRINCIPAL CITIES

Now... metalclad primary gear for ...in one Low Cost





SIMPLIFY PREFERRED-TO-EMERGENCY SWITCHING WITH

S & C's new "Package" approach

Here is a simplified solution to the demands for uninterrupted service . . . a complete throw-over "package" that overcomes the disadvantages of previous methods that were unsightly, costly, and complicated. S&C's new package is compact, economical, and completely enclosed—ideal for distribution and industrial substation applications.

LOW COST—Standardized design and factory assembly techniques provide substantial savings. The entire system is factory tested and ready to set into place . . . no costly on-the-site construction, assembly, or check-outs to make.

SAFE—The tamper-proof metalclad unit prevents access to unauthorized persons. Thus it is suitable for residential and industrial areas.

ATTRACTIVE APPEARANCE — All sensing, switching, and protective devices are enclosed in a metalclad unit. There are no ugly motor-driven, pole-mounted switches. Simple lines, neutral finish, and compact, streamlined construction are in keeping with the planning of today's residential and commercial neighborhoods.

15-CYCLE AUTOMATIC THROW-OVER—Throw-over in case of an outage is accomplished in about 15 cycles or less, rather than the several seconds required with motor mechanisms.

FULL LOAD INTERRUPTION—S&C Load Interrupter components permit the entire load to be dropped at any time under any conditions except short circuit.

throw-over schemes

Package

A TYPICAL S&C THROW-OVER PACKAGE

Super-Durabake Finish is beautiful and long lasting . . . prevents rust and minimizes maintenance.

S&C Power Fuses protect transformer primary whether supplied by preferred or emergency source.

S&C Load Interrupter on preferred source opens on power failure.

S&C Load Interrupter on emergency source closes on power failure.

S&C Gear is a complete package ready for service. Just make up the potheads . . . no on-the-site engineering, assembly or testing required.

Potential Transformers sense both preferred and emergency sources . . . transfer occurs only if there is voltage on the alternate source. (Secondary sensing is optional.)

Control Panel and Operators (at rear of center section) provide for load transfer to an emergency source of power when there is a loss of voltage on the preferred source. With economical semi-automatic spring operators, the load is returned manually at the convenience of the operator. With optional hydraulic operators, back transfer occurs either when preferred voltage is restored or when a loss of voltage occurs on the alternate source.

S&C

Specialists in High-Voltage Switchgear for Electric Utilities since 1910

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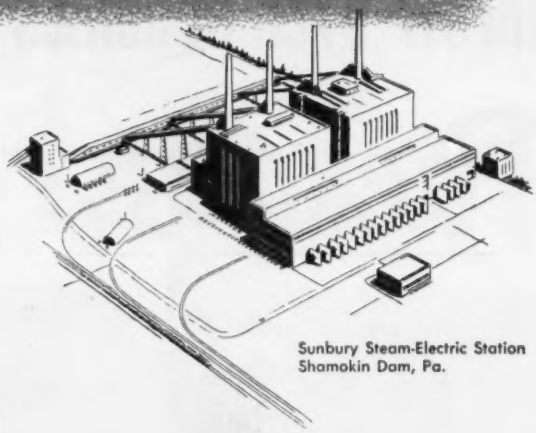
. . . an *exclusive* user of
Grinnell
prefabricated piping
for 16 years

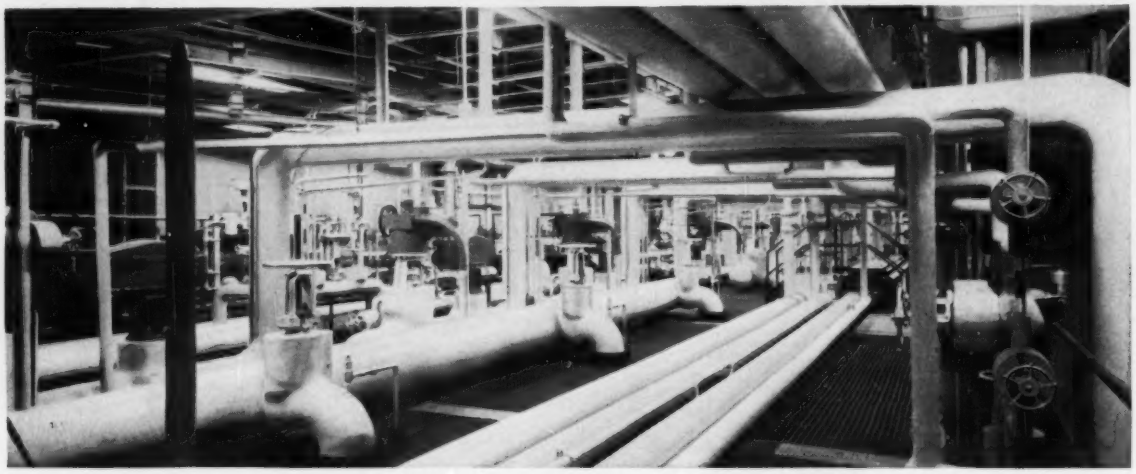


Sunbury Steam-Electric Station
Shamokin Dam, Pa.

Since 1940, Pennsylvania Power & Light Company has awarded *all* its prefabricated piping work to Grinnell. Some idea of the extent of this confidence in the competence and skill of Grinnell piping specialists can be drawn from the fact that during this 16-year period there were 8 new units installed — with a total capability of close to 800,000 kw's.

Among other companies in the power field which have indicated a marked preference in the past for Grinnell Piping Products are Duke Power, a Grinnell Prefabricated Piping user for 44 years; New England Electric System, a 6-year, 6-time repeat customer; and Carolina Power & Light, a 7-year, 7-time Grinnell repeat customer.

Where some of the 4,500 individual fabricated piping assemblies made by Grinnell were installed at the Sunbury Station.



The big jobs in power piping go to Grinnell because Grinnell's shop facilities offer these practical advantages . . . superior quality of finished product; faster "on the job" assembly; lower final cost. Assign *your* next piping job to Grinnell.

Work done by Grinnell for Pennsylvania Power & Light Company

1940-41	Cedar Station, Unit #6
1941-42	Hauto Station, Unit #6
1949	Sunbury Station, Units 1 & 2
1950	Sunbury Station, Unit #3
1953	Sunbury Station, Unit #4
1954	Martins Creek Sta., Unit #1
(Scheduled Completion)	
1956	Martins Creek Sta., Unit #2

GRINNELL

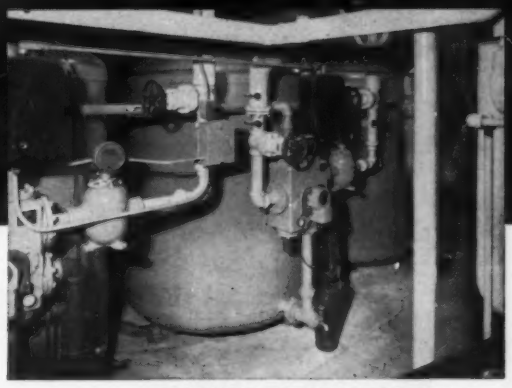
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

problems in water conditioning...

SIMPLIFIED CONTROL



COCHRANE ZEOLITE SOFTENER DELIVERS WATER of zero hardness by the soap test. All commonly known zeolites—greensand, synthetic gel, sulfonated coal and the various styrene medium capacity resins are available for most practical individual application. Units can be adapted for automatic operation. Three 6' x 6' fully automatic Cochrane Zeolite Softeners above provide a capacity of 288,000 lbs. per hr.

Cochrane

Hydromatic Valve *assures* easy, accurate control of ion exchange equipment

Here is a valve so simple to operate that no knowledge of softening equipment or of the ion-exchange process is required!

The Cochrane Hydromatic Valve consists of an integrated nest of hydraulically-actuated diaphragm valves. Valves are so constructed that it is impossible for any of them to be out of position during operation. Compass point positions for four operating stations on the pilot reduce operating error—assure maximum delivery of high quality effluent without danger of contamination. "Drop tight" construction eliminates the possibility of scoring. Compact, easy to operate Hydromatic Valve is designed for years of dependable operation. Write for Bulletin 4520-B.

The Cochrane Corporation designs and manufactures complete lines of deaeration, precipitation, ion exchange, and water conditioning equipment . . . Consult Cochrane First!

COCHRANE CORPORATION · WATER AND HEAT ENGINEERS SINCE 1863 · PHILADELPHIA

Cochrane CORPORATION

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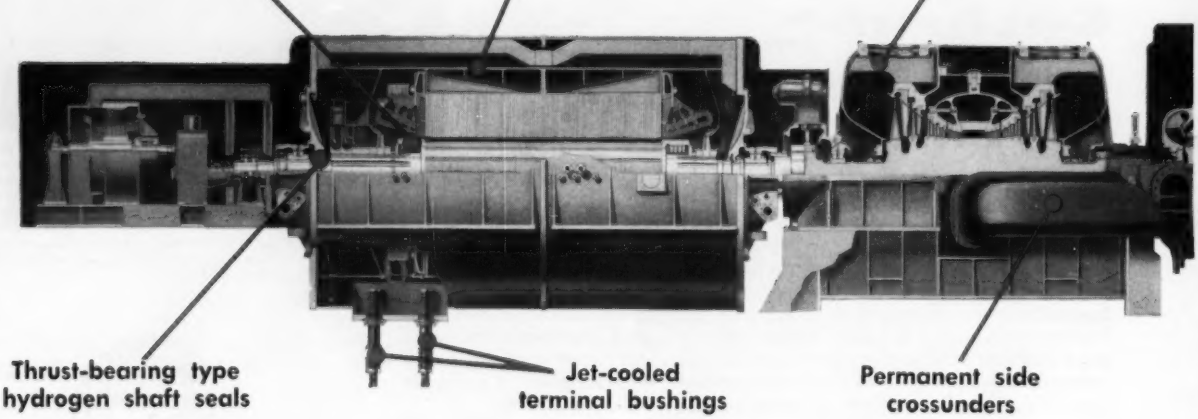
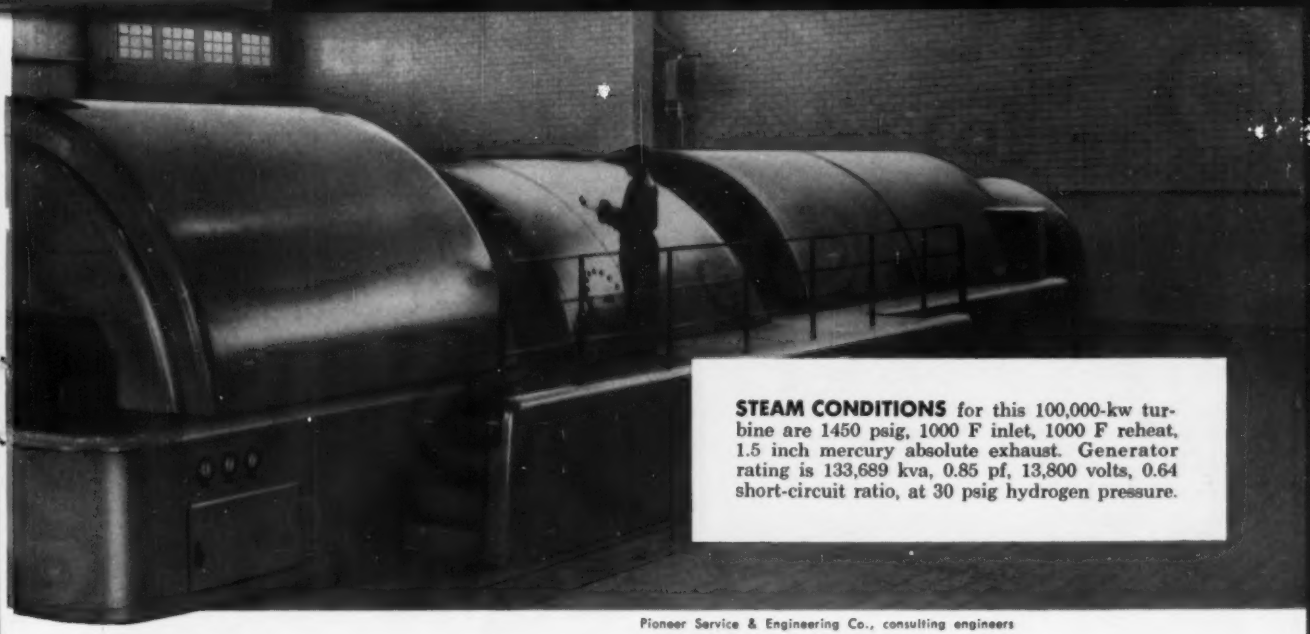
CAPACITY of this station has been raised to 270,000 kw by the installation of an Allis-Chalmers 100,000-kw turbine-generator. The new unit makes the station one of the largest in the area.

Here's MORE Power


Supercharged cooling of rotor
Symmetrical stator with flexible core support
Fabricated steel low pressure casing
Thrust-bearing type hydrogen shaft seals
Jet-cooled terminal bushings
Permanent side crossunders

A-C ALLIS-CHALMERS

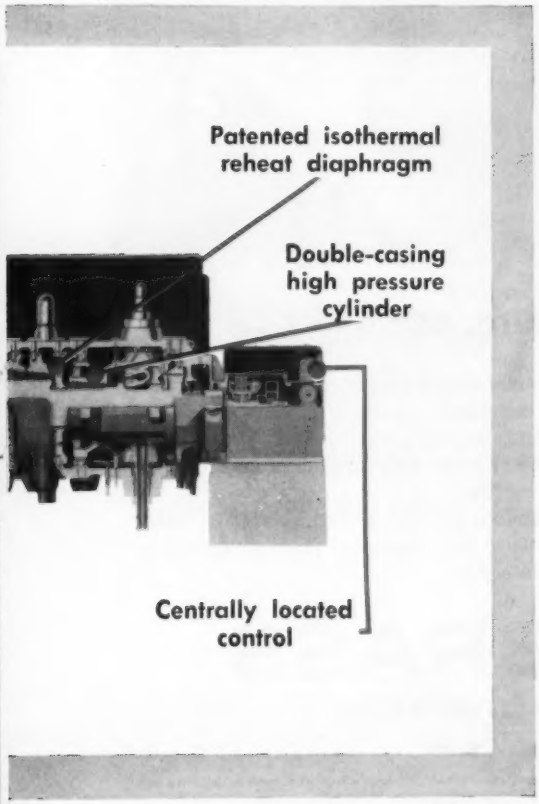
ALLIS-



STEAM CONDITIONS for this 100,000-kw turbine are 1450 psig, 1000 F inlet, 1000 F reheat, 1.5 inch mercury absolute exhaust. Generator rating is 133,689 kva, 0.85 pf, 13,800 volts, 0.64 short-circuit ratio, at 30 psig hydrogen pressure.

Pioneer Service & Engineering Co., consulting engineers

Pioneering



New 100,000-kw reheat unit in midwestern utility combines side-crossunder, tandem-compound steam turbine with supercharged hydrogen-cooled, 3600-rpm generator.

To meet present and future requirements, this modern Allis-Chalmers turbine-generator combination went into operation recently in a large midwestern utility power plant.

Typical of Allis-Chalmers tandem 3600-rpm reheat turbines for ratings of 75,000 to 250,000 kw, this 100,000-kw unit joins others already proved in operation.

You can continue to look to Allis-Chalmers for MORE pioneering of turbine-generator units engineered to your requirements — up to 500,000 kw. For more information, contact your nearby A-C representative, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4985

CHALMERS

How long do you expect to STAY in business?

If you are planning for a long future, use COPPER

Your tomorrows! *They* decide which raw materials you should choose.

Considering that it takes years to establish a reputation, isn't it a mistake to overlook the use of copper or copper components in your product that can protect its good name?

For one big thing about this metal is that it endures. It serves for years, generations, centuries.

This characteristic of copper can help you to protect your Company's future. For your customers like to get their money's worth. And that includes long-term use. Endow your product *now* with copper's own long life!

Copper can look back on a history as old as man's . . . and forward to a future as promising. *Stay* in business with *copper!*

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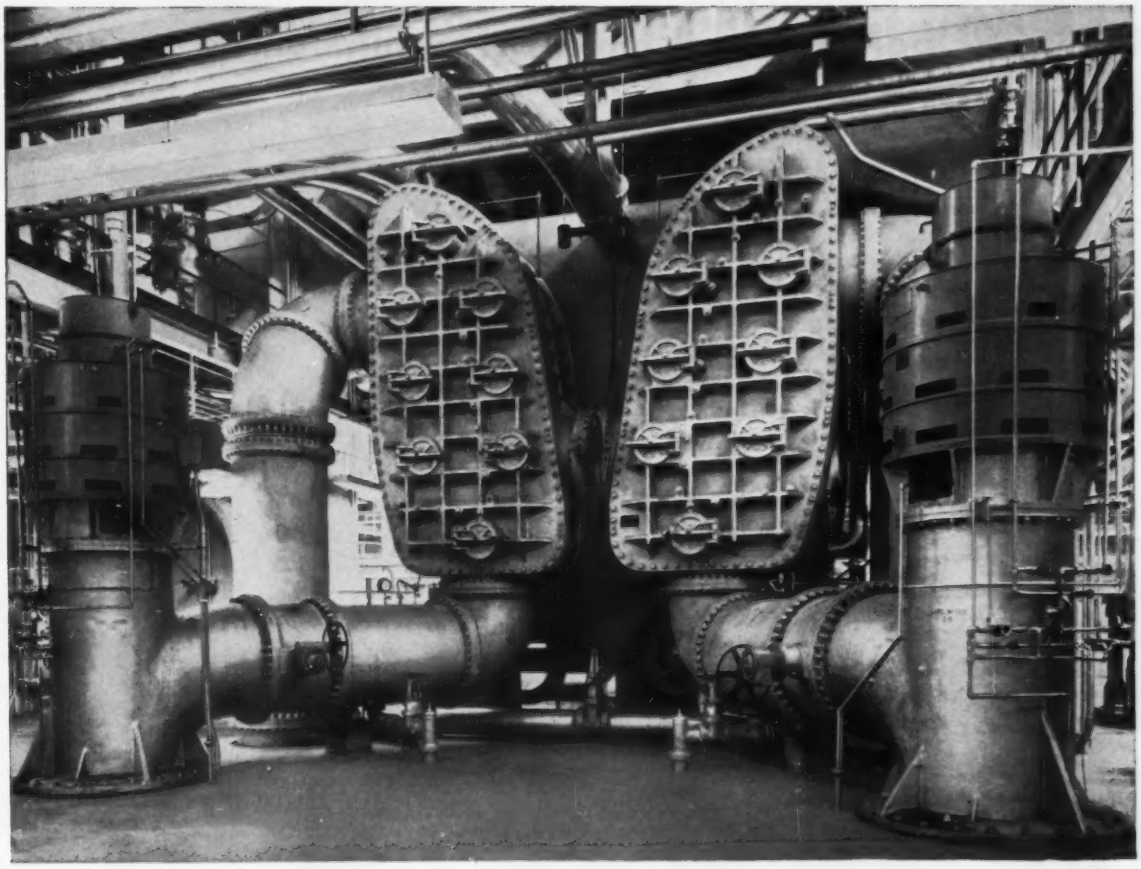
Best conductor of electricity commercially available

Does not rust . . high corrosion resistance

Best heat transfer agent of all commercial metals

Easy to machine, form, draw, stamp, polish, plate, etc.

Welds readily . . . excellent for soldering and brazing



TWO MORE FW surface condensers installed by ALABAMA POWER CO.

Two, 87,000 sq. ft. cross-flow, two-pass condensers serve new 125,000 kw turbines at Barry Station, Mobile, Ala.

The huge Foster Wheeler surface condenser shown above is one of two duplicate units recently installed at Alabama Power Company's Barry Station in Mobile, Alabama. Each of these two 87,000 sq. ft. cross-flow, two-pass condensers serves a 125,000 kw turbine, condensing 650,000 pounds of steam per hour with 89,100 gpm of circulating water at 80F. Turbine exhaust pressure is 1.87 hg.

Alabama Power's confidence in FW condensers is based on long experience. Including units installed, under construction and on order, *seven* large Foster Wheeler surface condensers have been purchased for various stations on the Alabama Power Company system.

For information on FW condensers to meet your steam-plant requirements, contact your Foster Wheeler representative or write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

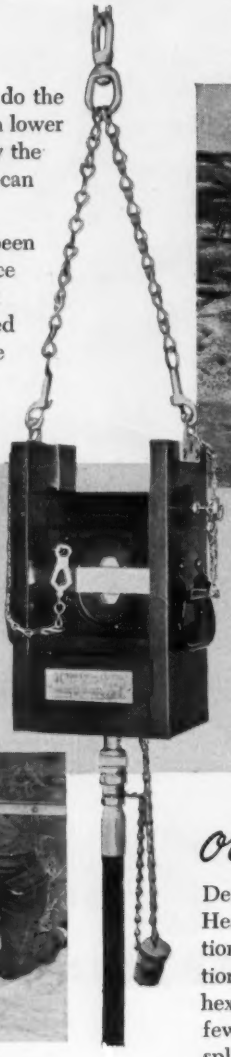
NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

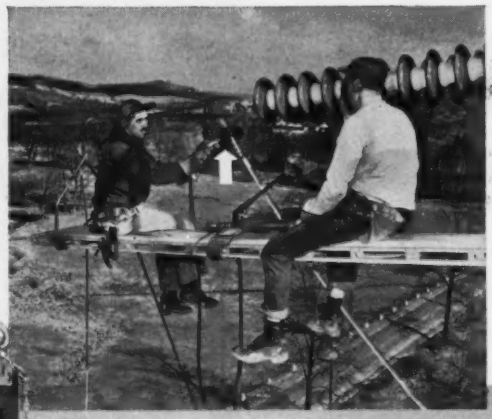
Now *ONE* portable tool makes transmission line splices

OVERHEAD

It's no longer necessary for linemen to do the sagging and marking overhead and then lower the line to the ground for splicing. Now the complete operation, including splicing, can be performed overhead.

T&B's Forty-Ton Hydraulic Head has been specially designed for heavy-duty service in building transmission lines. Since it weighs only 36 pounds, this factory-rigged tool can be put into operation anywhere a man can throw a rope. Safety chains keep all removable parts from falling to the ground.





T&B's Forty-Ton Hydraulic Head, Cat. No. 21940, specially designed for transmission line building.

or ON THE GROUND

Demountable legs hold T&B's Forty-Ton Hydraulic Head at convenient working height when installations are being made on the ground. During operation, hardened steel dies compress fitting and cable hexagonally into one homogeneous mass . . . all in a few seconds. The same die set installs tension splicers, dead ends, loop splicers and taps, tees and terminals.

Modern hydraulic design has virtually eliminated the need for maintenance. However, field maintenance is simple and practical. The 21940 Installing Head can be completely disassembled and reassembled in less than one-half hour with these common tools: screw driver, Allen wrench, and mallet.

T&B Bulletin 70 gives a detailed description of the Forty-Ton Hydraulic Head as well as complete lines of T&B connectors, tools, and accessories for transmission line building. Send for FREE copy.

LOOK FOR THIS SIGN —

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-418

THE THOMAS & BETTS CO.

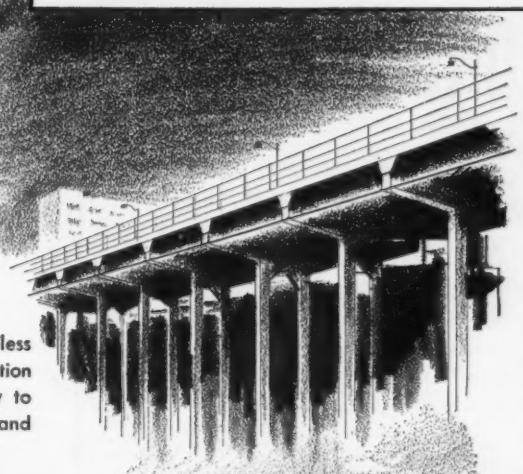
INCORPORATED

14 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

what you should know about HAZARD SELF-SUPPORTING CABLE

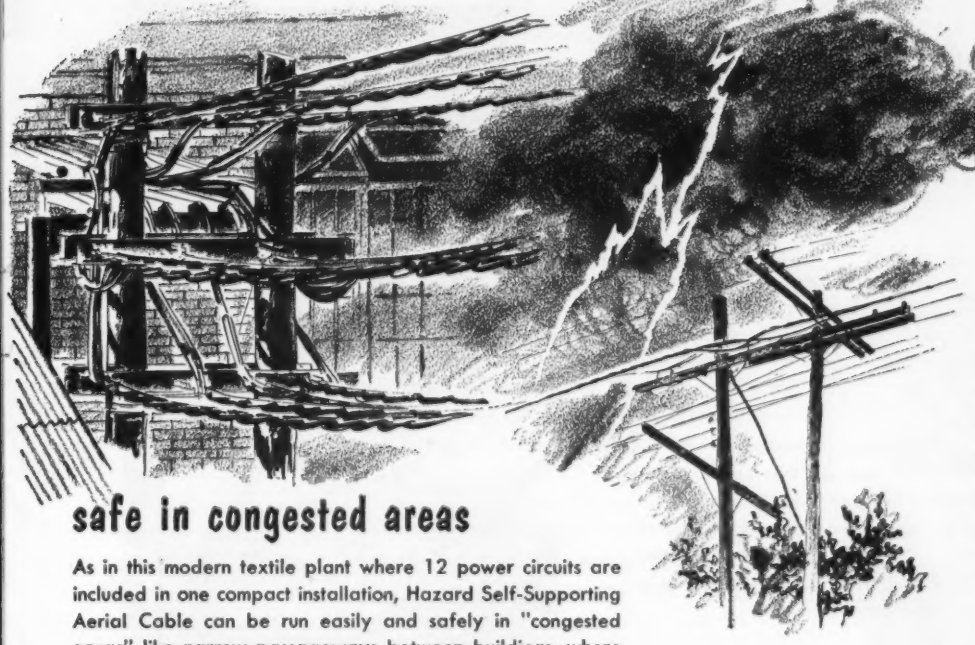
installation costs are low

. . . surprisingly low. In many cases, far less than for open wire construction. Installation costs are low because the cable is easy to work, splice and terminate. Maintenance and tree trimming costs are greatly reduced.



uses existing construction

When you need power in a hurry—can't spare the time or expense to buy conduit or erect special poles and towers—your wisest choice would be Hazard Self-Supporting Aerial Cable. It can be strung along the sides of buildings, under bridges or viaducts, on existing poles and towers or on almost any structure between power source and point of use.



safe in congested areas

As in this modern textile plant where 12 power circuits are included in one compact installation, Hazard Self-Supporting Aerial Cable can be run easily and safely in "congested areas" like narrow passageways between buildings, where trees are a problem, where the aerial approach is already crowded or on poles and towers too full for another bare circuit. With its superior insulation, flashovers and danger to personnel and property are effectively minimized.

safe against the elements

Hazard Self-Supporting Aerial Cable is widely used for its ability to resist the effects of moisture, heat, abrasion, cold and corrosive industrial atmosphere. Add to this its installation versatility, and you will quickly see why it is becoming an increasingly popular system of power distribution.

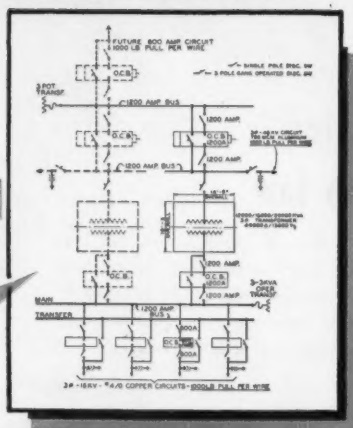
Complete information on Hazard Self-Supporting Aerial Cable is available in the free Bulletin H-464. Hazard Division of The Okonite Company, Passaic, N. J.

3631

HAZARD PRODUCT OF OKONITE RESEARCH INSULATED CABLES

HOW SAVANNAH ELECTRIC AND POWER COMPANY SAVED TIME AND MONEY ON NEW SUBSTATION

Southern States' Easy 3-Step Plan Eliminated Headaches and Problems of Both Design and Production

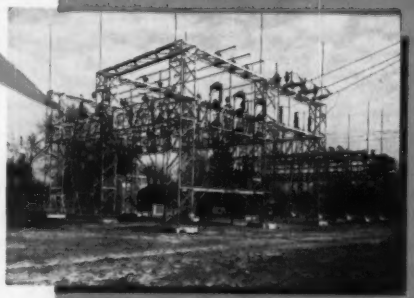


Here is how progressive, forward-looking Savannah Electric and Power Company obtained its Boulevard Substation in rapid order at substantial savings in both time and money:

STEP 1 Utility's engineers made this one-line diagram with basic specifications.

STEP 2 From these, Southern States' engineers developed complete plans, details and specifications for a substation that met immediate needs and provided for future load growth in fast-growing Savannah.

STEP 3 Upon approval, Southern States completed the station—took care of engineering, production, schedules; supplied the steel structure, air break switches, disconnects and bus supports.



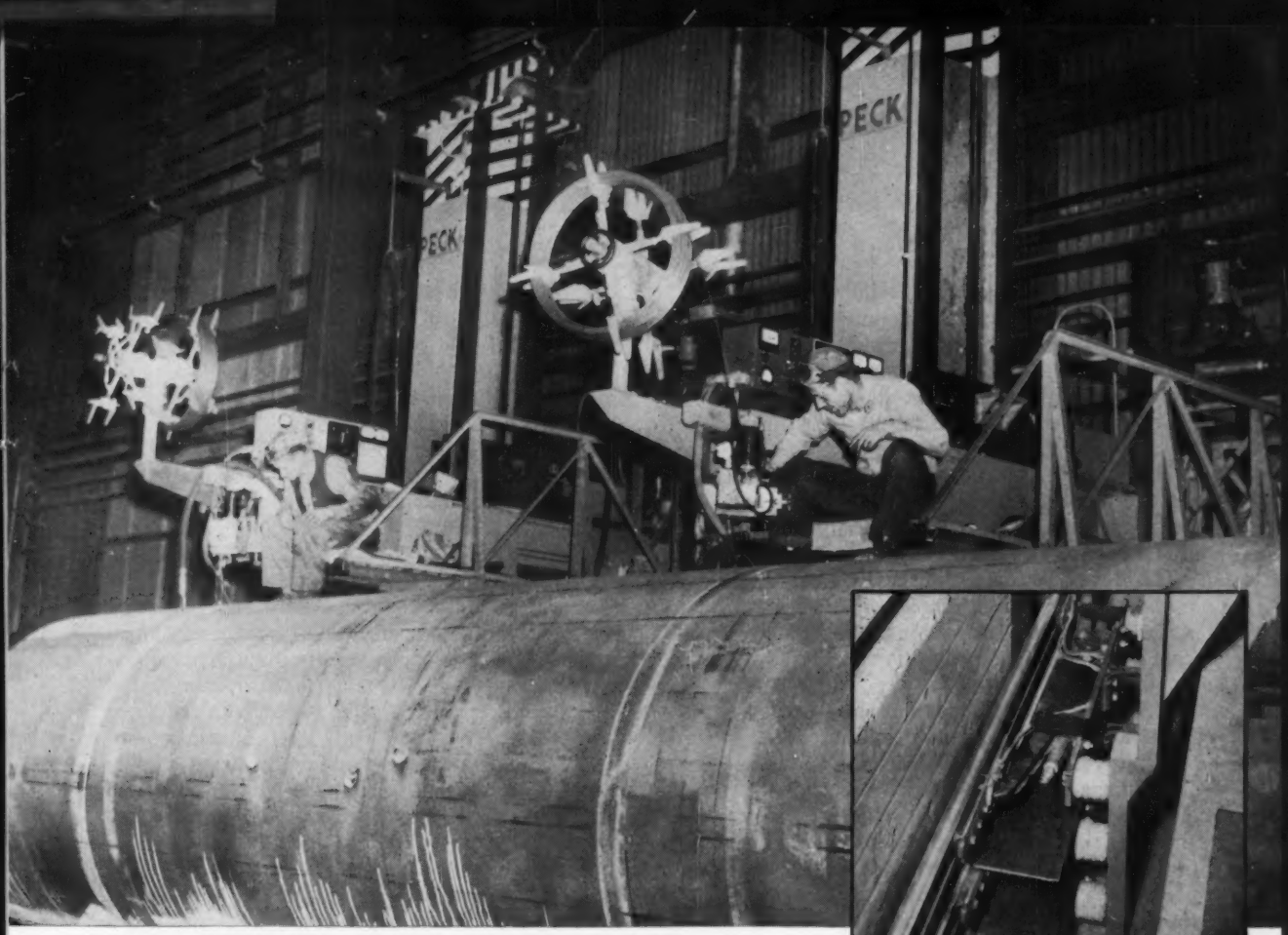
Savannah, Georgia—46 kv—7.98/13.8 kv substation with 4 low-voltage circuits, three 46 kv circuits (1200 amp switches), main and transfer bus on low voltage. Low voltage bank breaker with by-pass (1200 amp switches). Present transformer bank capacity: 20,000 kva; future bank addition, 20,000 kva.

THE RESULT: An efficient, functional substation erected with a minimum of fuss and bother and at accountable savings to Savannah Electric and Power Company.

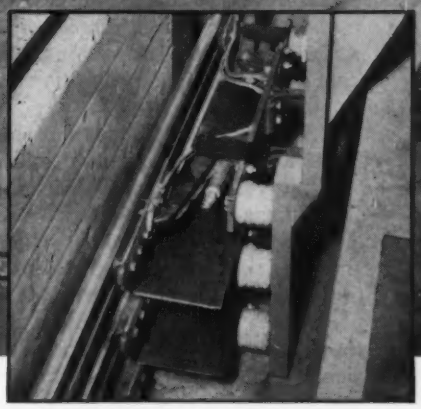
Your company, like utilities coast to coast, can capitalize on Southern States' "3-Step Plan" for distribution and transmission substations. Get the facts from your Southern States representative, or write direct for full information.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA:
Dominion Cutout Co., Ltd., Toronto



TANDEM WELDING HEADS in operation on heavy pressure vessel at Foster Wheeler Corporation.



VERTICALLY STACKED conductor rails with collectors running at right angles. This system operates at 675 amps. 440 volts.

KEYSTONE

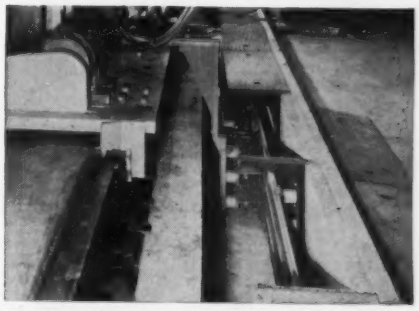
Clears the Deck for Action

Integrated Aluminum Conductor System Powers Automatic Welders Safely, Efficiently

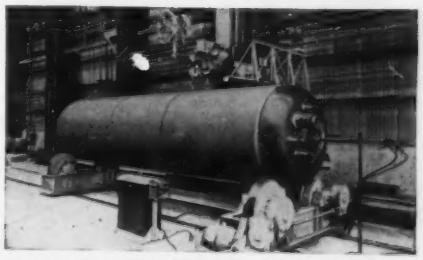
FOSTER WHEELER'S streamlined welding equipment gets much of its efficiency from the KEYSTONE Aluminum Conductor System that powers it. Hazardous cables are eliminated; this promotes safety and prevents interference which might cause hesitation or vibration—and thus an imperfect weld on the pressure vessel.

Welding generators may be completely mobile (as in this case) or stationary. Full welding current can be conducted where needed; conductor lengths have been installed up to 360 ft., can be longer. There's no limit as to length of rails or amperage handled with KEYSTONE Aluminum Conductor Systems.

IMPORTANT NOTE: This application is only one of many in all types of industries. It may suggest a power distribution method in your plant. Write for "Case Histories" on Keystone Aluminum Conductor Systems."



RECESSED POWER source with safety plates removed to show side mounted aluminum conductors and collectors.



ROTATING CRADLE and moving welder permits horizontal and circular welding. Behind cradle is KEYSTONE Aluminum Conductor System.

KEYSTONE **ELECTRIC SERVICE MANUFACTURING CO.**

Philadelphia 32, Pennsylvania

the Miracle on

On the banks of the Ohio, right now, these two huge electric plants are turning out power at the rate of over 18-billion kilowatt-hours annually. They are, respectively, the first and second largest investor-owned power plants in the world.

They stand on what was farmland less than three and one-half years ago.

Their completion, substantially ahead of schedule, is the result of the outstanding teamwork of management, investors, engineers, technicians and workers in privately-owned utilities and their suppliers.

The vast power output of these plants, *almost half as much electricity as all France produces*, is ready to assure uninterrupted operation of the Atomic Energy Commission's uranium diffusion center near Portsmouth, Ohio.

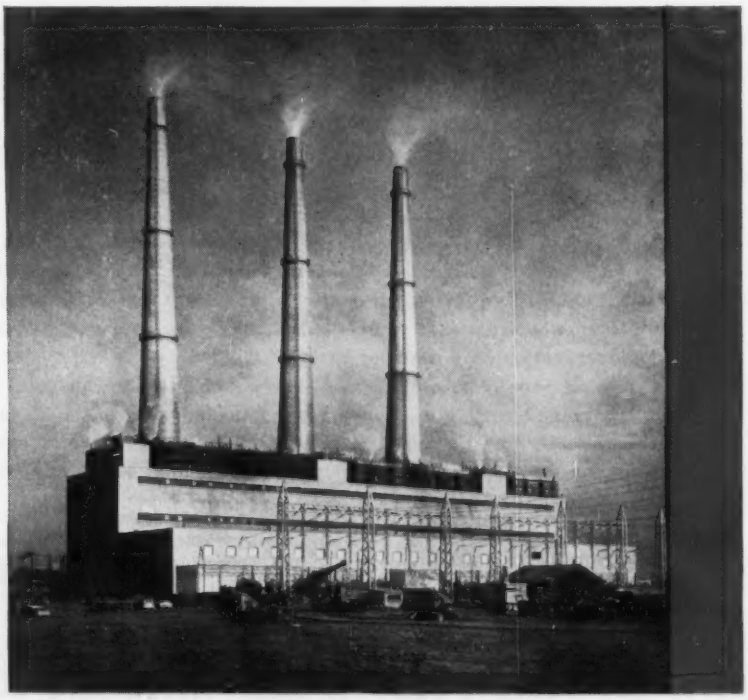
When the AEC made its enormous needs known, 15 private electric companies* joined forces to form the Ohio Valley Electric Corporation and its subsidiary, Indiana-Kentucky Electric Corporation. Pooling their resources in men, money and experience, they and their suppliers worked faster than the construction timetable. In quick order the 11 gigantic B&W boilers, the turbines, generators, buildings—and all the vast complex of auxiliary equipment—were designed, built and placed into operation.

The first generating units were placed in commercial operation in February 1955. The final unit went on the line in February 1956 at Clifty Creek, marking the largest installation of power in a single project ever made in a twelve-month period.

All Americans can be proud of OVEC-IKEC for this great accomplishment. What appears to be a miracle, in reality is, a clear demonstration of what private enterprise and enlightened government, working together, can accomplish for the benefit of the entire nation.

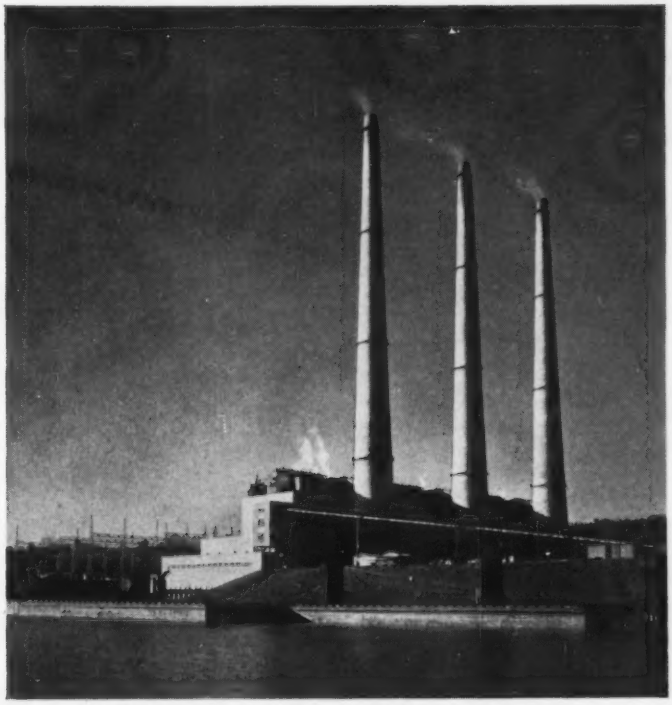
The future will undoubtedly pose many similar challenges. Can they be met? Are enough young engineers, business men, technicians, and skilled workers being developed to accept these great responsibilities? Babcock & Wilcox, like so many other American firms, is pledging its resources to guarantee that the answer will be "Yes!" Recruiting and training young men, expanding and modernizing production facilities, conducting extensive research and engineering development projects—all are part of a long range B&W program to contribute its share to the technical and economic progress so necessary for the continued growth of the nation.

The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N. Y.

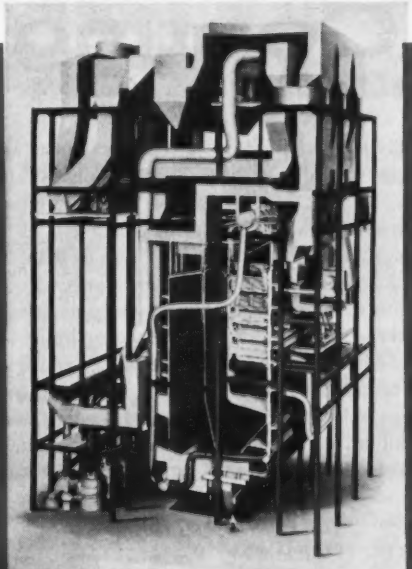


KYGER CREEK PLANT, at Cheshire, Ohio, with a capacity of 1,075,000 kilowatts, is the world's second largest investor-owned power plant.

the Ohio River



CLIFTY CREEK PLANT, at Madison, Indiana, with a capacity of 1,290,000 kilowatts, is the world's largest investor-owned power plant.



11 B&W Open-Pass Boilers generate steam for the two plants. Each boiler produces 1,330,000 lb of steam per hr at 2000 psi and 1050 F, with reheat to 1050 F. The utilization of high temperatures, high pressures and reheat at both plants places them among the most efficient and economical in operation.

***SPONSORING COMPANIES OF OVEC-IKEC**

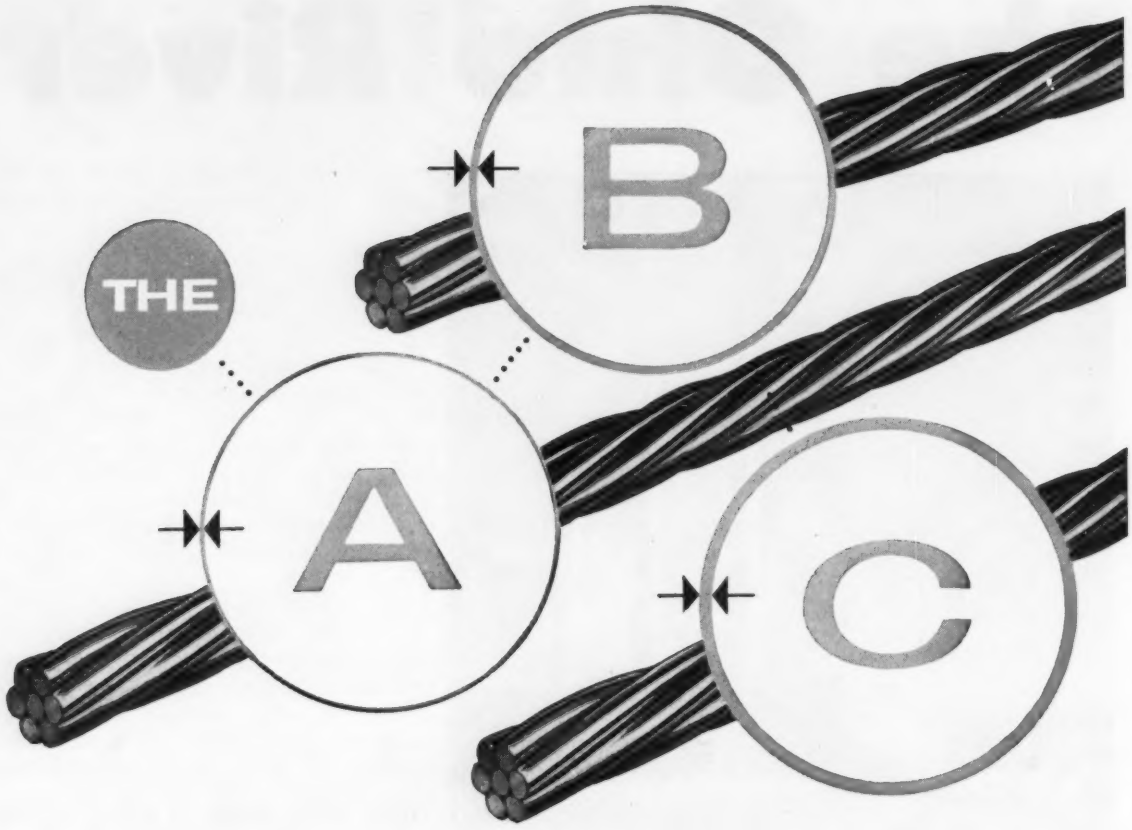
Appalachian Electric Power Company* • The Cincinnati Gas & Electric Company • Columbus and Southern Ohio Electric Company • The Dayton Power and Light Company • Indiana & Michigan Electric Company* • Kentucky Utilities Company • Louisville Gas and Electric Company • Monongahela Power Company** • Ohio Edison Company • Ohio Power Company* Pennsylvania Power Company*** • The Potomac Edison Company** • Southern Indiana Gas and Electric Company • The Toledo Edison Company • West Penn Power Company**

* Subsidiary of American Gas and Electric Co.
** Subsidiary of The West Penn Electric Co.
*** Subsidiary of Ohio Edison Co.

G 749

BABCOCK & WILCOX

BOILER DIVISION



# of Strand Coating

Probably the greatest enemy of strand is rust. Give it an opening, a tiny foothold, and its work can begin. But the proper type of protective coating can shut the door in its face.

Bethlehem developed such a coating years ago, a coating that has stood the test of time. It is a jacket of highly pure zinc applied to the wires of strand by a special electrolytic process called bethanizing. This process insures a coating of uniform thickness and great ductility; actually, the zinc armor is so ductile that it will not crack or peel even under severe bending.

That in itself is a really great advantage. But equally important is another fact: bethanized coatings are available in *three* different weights, known as A, B, and C. The lightest, coating A, is the thickness of extra-galvanized. Coating B is twice as thick as A; coating C, three times as thick as A. All meet standard ASTM specifications.

Thus the user of Bethlehem strand has a choice for every field condition. He is never limited to a single coating. With Bethlehem's A, B, and C coatings always available, the purchaser can pick and choose; select the one that meets his needs *exactly*.

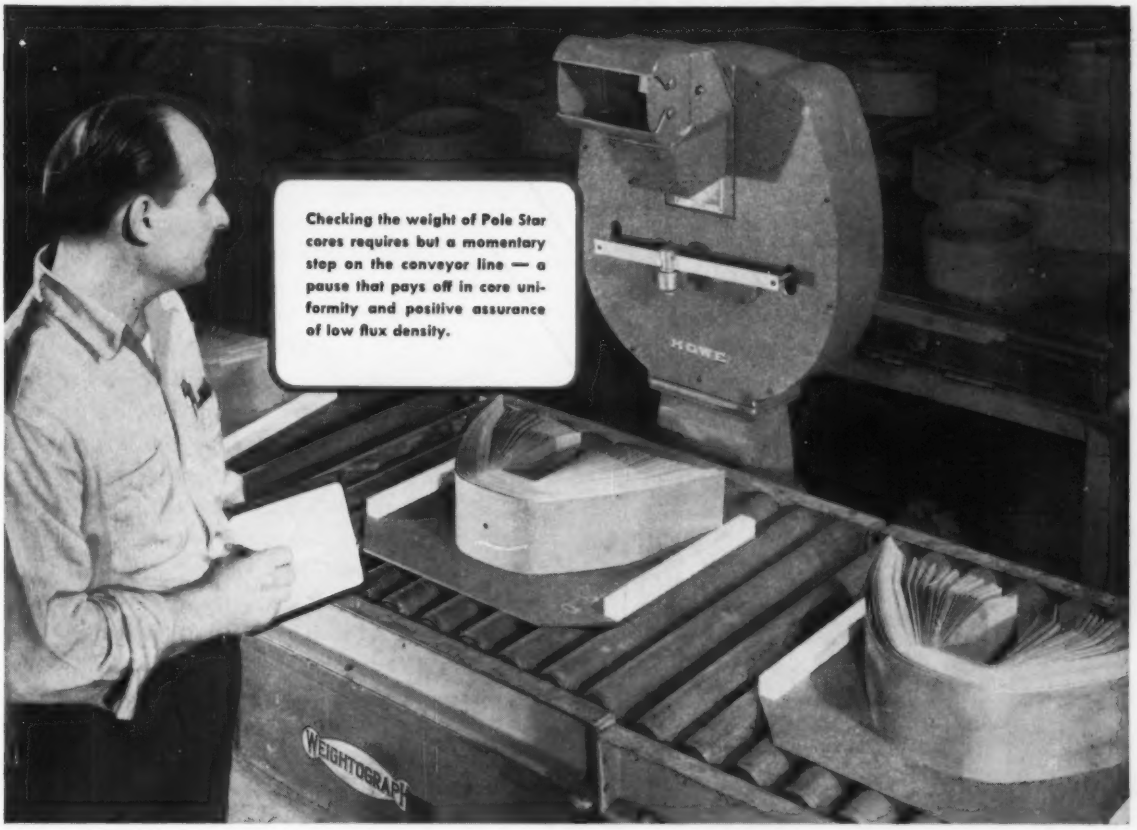
Call or write for additional information. Our nearest office will gladly supply complete details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL


Checking the weight of Pole Star cores requires but a momentary stop on the conveyor line — a pause that pays off in core uniformity and positive assurance of low flux density.
HOWE
WEIGHTOGRAPH

He's weighing the proper **flux density** into a **POLE STAR** core — Here's why . . . .

Flux density of the core (number of magnetic lines per square centimeter) is worth dollars and cents to the user of distribution transformers. High flux density means high exciting current, which, when multiplied by hundreds or thousands of transformers on the line, can increase distribution costs.

Because flux density is dependent upon the amount of steel used in the core, Pennsylvania Transformer Company has set up an effective system of checks to make certain that every lap-on-top Pole Star core contains the proper amount of steel. Laminations are counted, the core is measured, and then — because there can be minute but important variations in the steel itself — the core is *weighed* to provide a beyond-a-shadow proof that the *right* amount of steel has been used in each Pole Star core.*

That's why, with Pole Stars, you get proper flux density and low exciting current *every time.*

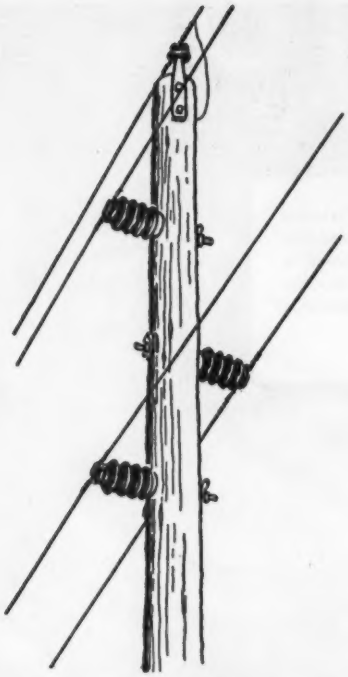
**This extra precaution precludes, for example, any possible variations in the cores as a result of slight "wrinkles" in the steel, or as a result of otherwise unnoticeable discrepancies in the insulating coating of the steel.*

167 Production Controls make Pole Star best!

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

Pole Star Transformers are available in all standard single phase distribution sizes from 3 through 500 kva, through 67,000 volts.



A TROUBLE-FREE DISTRIBUTION LINE AT LOWEST COST

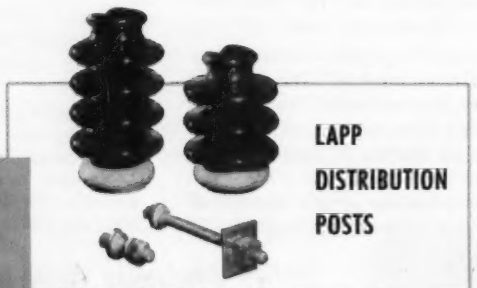
You can eliminate the cost of cross-arms, braces, brackets and other hardware—and probably build the best-performing distribution line on your system—by using new Lapp Distribution Post insulators. You just mount 'em horizontally, bolted directly to the pole.

This practice has the precedent of companies that have built such lines with regular Lapp Line Posts —and report them as "completely trouble-free."

The two Distribution Post units, for duty at voltages up to 25 Kv, both develop 1500 lbs. cantilever strength at insulator top. Constructed as a solid one-piece porcelain, they are completely crack-proof and puncture-proof. With Lapp Fog-Type corrugations, they present an exposed uniform leakage path—most efficient for use in contaminated atmosphere. Radio-free by design, and greatly more rugged than any other type of distribution insulator against flashover, stones and bullets. Separable stud bolts provide for their use with studs of any length.

For application in dirt condition areas, horizontal mounting adds the extra advantage of *better* cleaning in wind and rain.

Write for complete description and specifications. Lapp Insulator Co., Inc., Le Roy, N. Y.



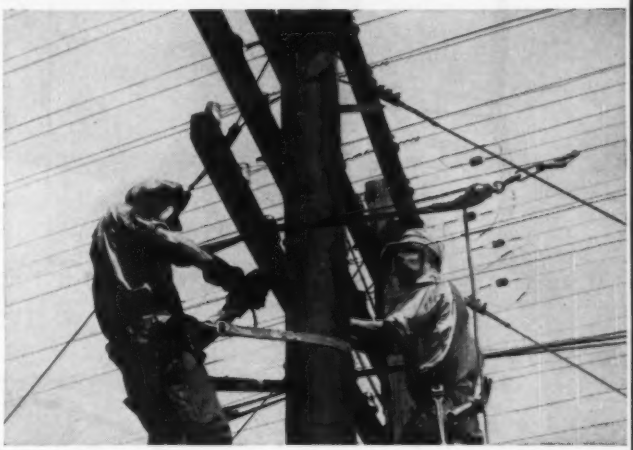
Lapp

Think how much you can save with pole line hardware *that lasts the life of creosoted poles!*

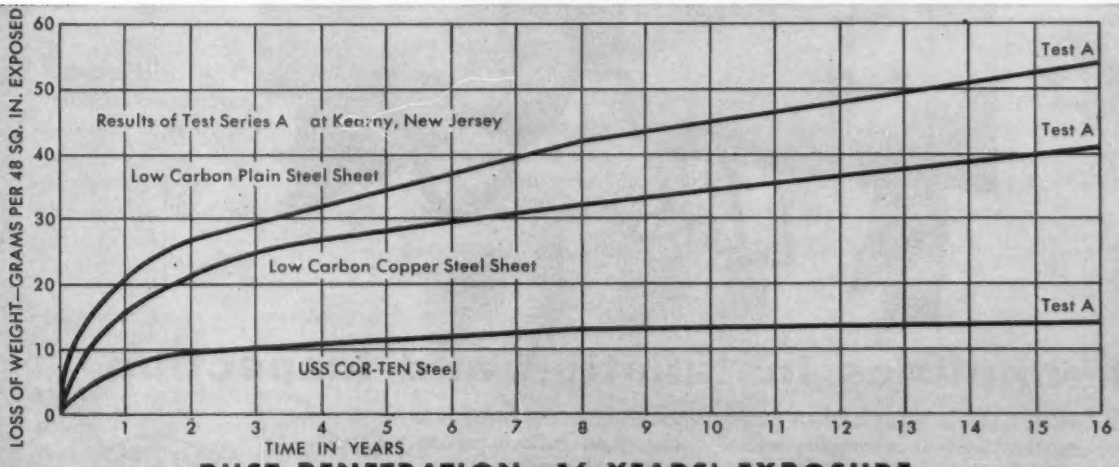
• When it comes to hardware replacement, the cost of hardware itself is small compared to the cost of installing it. Re-routing service (or even interrupting it) plus the cost of personnel and equipment to do the replacement work all run into money—BIG money!

You can cut these expenses to the bone when your pole line hardware is made of USS COR-TEN Steel. That's because rugged USS COR-TEN High Strength Steel has *4 to 6 times* the resistance to atmospheric corrosion of ordinary carbon steel. Thus, it takes *far* longer for rust to penetrate COR-TEN Steel hardware to a damaging degree. (The graph below shows conclusive proof of this fact.) And, COR-TEN Steel has a second line of defense. Because it has a 50% higher yield point than carbon steel, hardware made of COR-TEN can wear much thinner than carbon steel and still do its job efficiently without need for replacement.

For names of firms manufacturing pole line hardware from COR-TEN Steel and for a copy of our booklet, "USS COR-TEN *Steel Pole Line Hardware,*" write to United States Steel Corporation, Room 5159, 525 William Penn Place, Pittsburgh 30, Pa.



UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



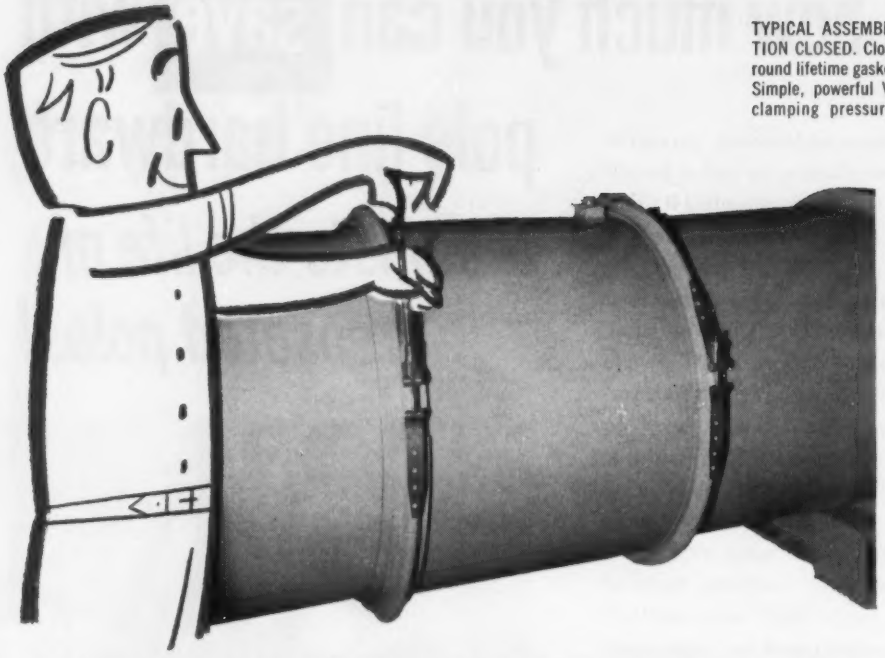
RUST PENETRATION—16 YEARS' EXPOSURE
(NOT GALVANIZED)

This chart shows that loss of weight (rust penetration) of USS COR-TEN High Strength Steel is one-fourth that of carbon steel and about one-third that of copper steel after exposure to severe industrial atmospheric conditions for 16 years.

USS COR-TEN High Strength STEEL

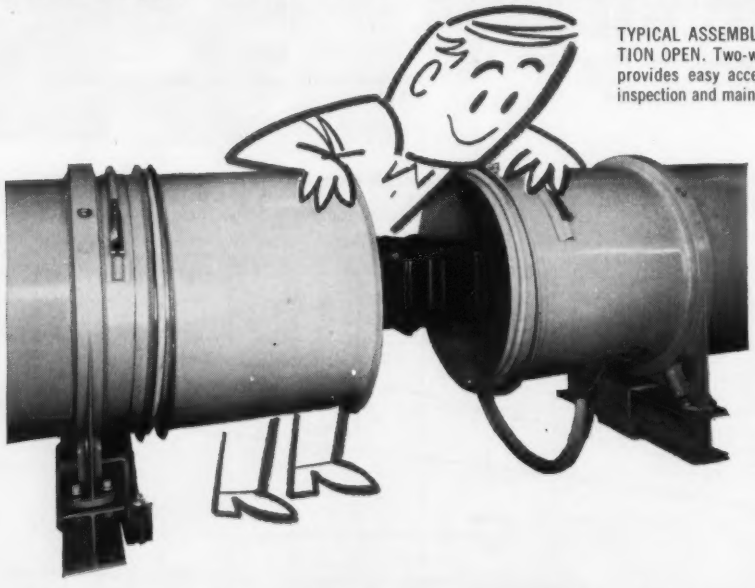
USS

UNITED STATES STEEL



TYPICAL ASSEMBLY WITH TELESCOPING SECTION CLOSED. Closure requires only two 1-piece round lifetime gaskets—easy to place and remove. Simple, powerful V-clamp couplings distribute clamping pressure uniformly around the ring.

New design of I-T-E Isolated Phase Bus



TYPICAL ASSEMBLY WITH TELESCOPING SECTION OPEN. Two-way sliding telescoping section provides easy access to connectors—simplifies inspection and maintenance.

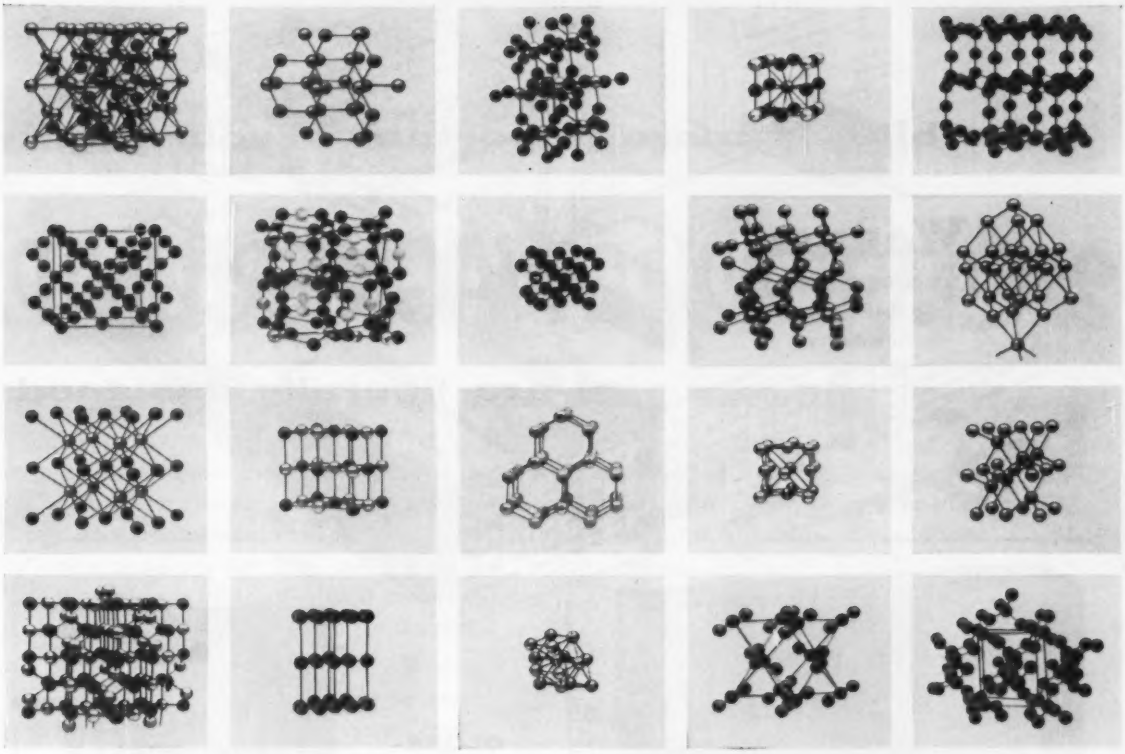
simplifies installation and inspection

All-welded aluminum basic assemblies—joined together with 2-way sliding telescoping sections—cut installation and inspection time. A V-clamp closure and a 1-piece round gasket in each telescoping section joint assure a permanently tight seal. This new design reduces gasketing 75%. In addition, it combines great strength and light weight with structural simplicity. And smooth inside surfaces prevent the accumulation of moisture.

Bulletins 10004-A and 10004-B describe I-T-E Isolated Phase Bus designs. For copies of these bulletins, write I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division



Crystal structure models. Top row, left to right: cuprite, zincblende, rutile, perovskite, tridymite. Second row: cristobalite, potassium dihydrogen phosphate, diamond, pyrites, arsenic. Third row: caesium chloride, sodium chloride, wurtzite, copper, niccolite. Fourth row: spinel, graphite, beryllium, carbon dioxide, alpha-quartz.

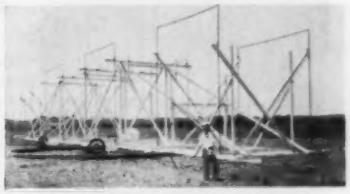
FROM ATOMS TO STARS

Research at Bell Telephone Laboratories ranges from the ultimate structure of solids to the radio signals from outer space. Radio interference research created the new science of radio astronomy; research in solids produced the transistor and the Bell Solar Battery.

Between atoms and stars lie great areas of effort and achievement in physics, electronics, metallurgy, chemistry and biology. Mechanical engineers visualize and design new devices. Mathematicians foreshadow new communications techniques.

Despite the diversity of their talents, Bell Laboratories scientists and engineers have much in common. A habit of teamwork channels these talents into great communications advances. These men have developed the world's finest telephone system. In doing so, many have become leaders in their fields. Opportunities for achievement await properly qualified scientists and engineers at Bell Telephone Laboratories.

Models of the atomic patterns in solids help Bell Laboratories scientists visualize their electrical behavior.



Directional antenna used by Karl G. Jansky in discovery of stellar radio signals at Bell Telephone Laboratories in 1932.

BELL TELEPHONE LABORATORIES

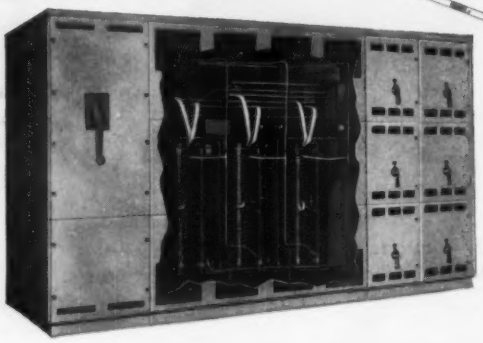
WORLD CENTER OF COMMUNICATIONS RESEARCH • LARGEST INDUSTRIAL LABORATORY IN THE UNITED STATES

Nothing is more important to your plant

Wagner®
TRANSFORMERS
... the choice of leaders
in industry

WAGNER UNIT

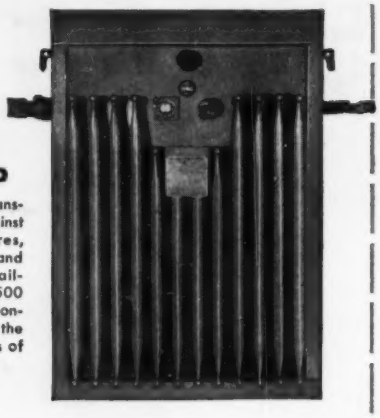
are liberally designed



DRY TYPE (OPEN, VENTILATED)—For indoor use only. Normally installed in a dry, dust-free atmosphere in a well-ventilated location. Light in weight... ideal for multi-storied buildings... no fireproof vaults necessary.

CLOSE-COUPLED

These liquid-filled transformers fit flush against switchgear enclosures, eliminating throats and saving space... available in ratings from 500 through 2000 kva. Connections are made at the bushings on the sides of the transformer.



OIL AND NOFLAMOL-FILLED

Oil-filled transformers are generally used outdoors. They can be used indoors if fireproof vaults are provided. Noflamol type in this model is filled with a non-inflammable liquid making it especially suitable for chemical plants, refineries and other locations where explosive liquids and gases are present.

NITROGEN-FILLED

These Class H Silicone Insulated Transformers offer many advantages in maintenance and safety. Suitable for indoor or outdoor use... covers are welded to tank...no cleaning problems, even in dust-filled areas...completely fireproof. In ratings up to 2000 kva.

than an uninterrupted flow of power....

SUBSTATION TRANSFORMERS

to give years and years of service

The importance of the transformers in your plant power distribution system cannot be over-emphasized. If a switch or a circuit breaker fails, only a part of the system is affected—but if the *transformer* fails, the entire system is dead.

Think of the cost to your plant in terms of cancelled orders and lost manhours in the event your present system broke down.

Why not check up now on the adequacy of your transformers? If you find that new units or a new distribution system is in order—Wagner can supply you with substation transformers *predesigned* to meet your requirements.

Wagner *Predesigned* Transformers offer you the advantage of a proved design in a completely assembled transformer, tested at the Wagner factory. They are built in standard ratings *which are coordinated with the specifications of unit substation builders.*

You save time...

...save job engineering costs...

...and get full Wagner Quality with the switchgear of your choice.

Write for Bulletin TU-205. It gives full information on Wagner Unit Substation Transformers for industrial power distribution systems.

For portable tools, machines and lighting systems GET THE RIGHT VOLTAGE CLOSE TO THE LOAD with these WAGNER DRY-TYPE TRANSFORMERS!

Save money through shorter runs of copper, reduced line losses and lower installation expenses. These Wagner Dry-Type Transformers are compact, light in weight and safe to use. Good for use where ventilated transformers are impractical. No fireproof vaults or other enclosures necessary... install inside or out.

The 150° rise transformer is standard in ratings 3 through 10 kva and is also available through 50 kva. 55° rise model is standard in 1, 1½ and 2 kva and the 80° rise transformer is standard in ratings 15 through 100 kva. Write for Bulletin TU-57 for full details.

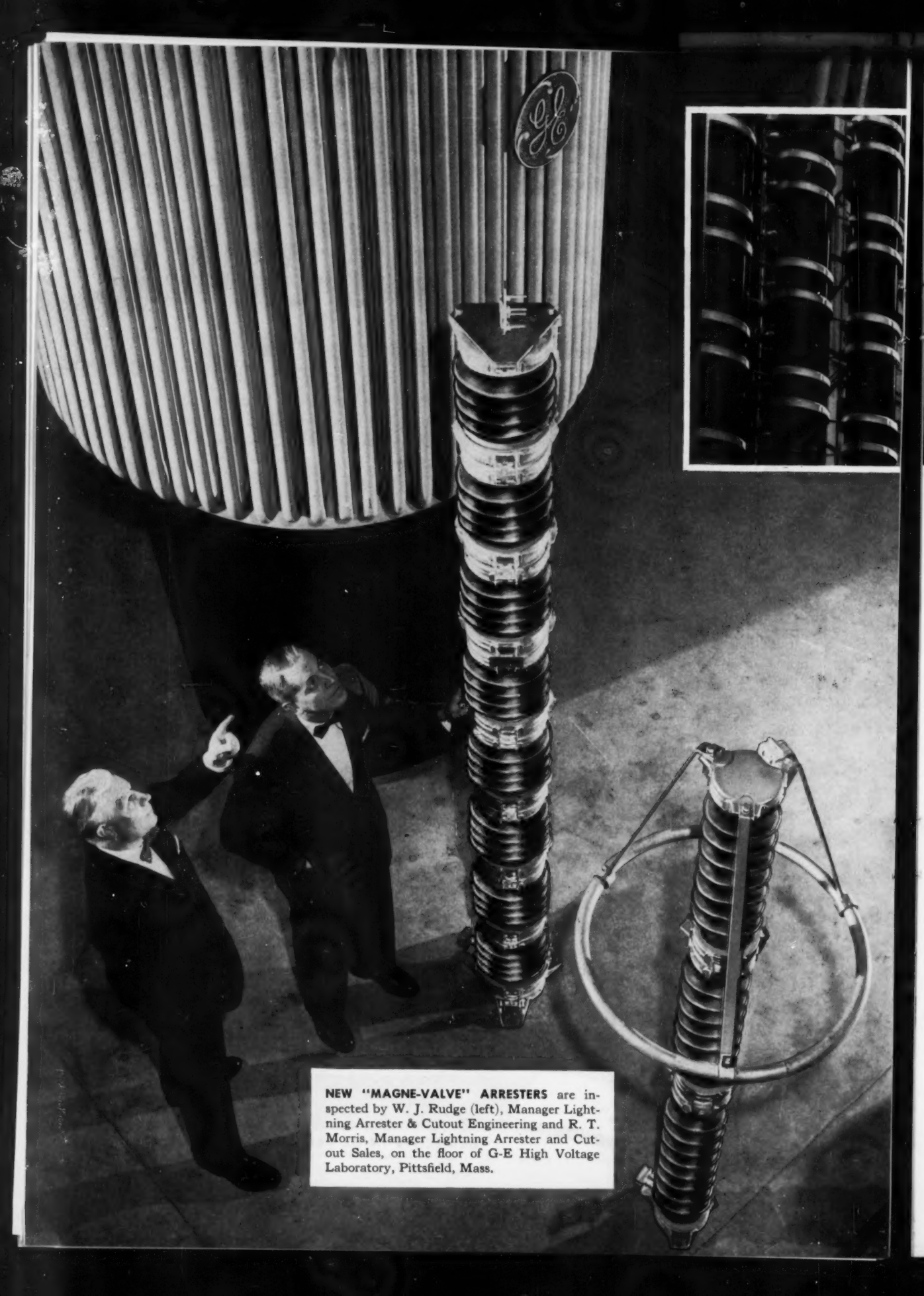
WAGNER ELECTRIC CORPORATION
56 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

Wagner Electric Corporation EST. 1891

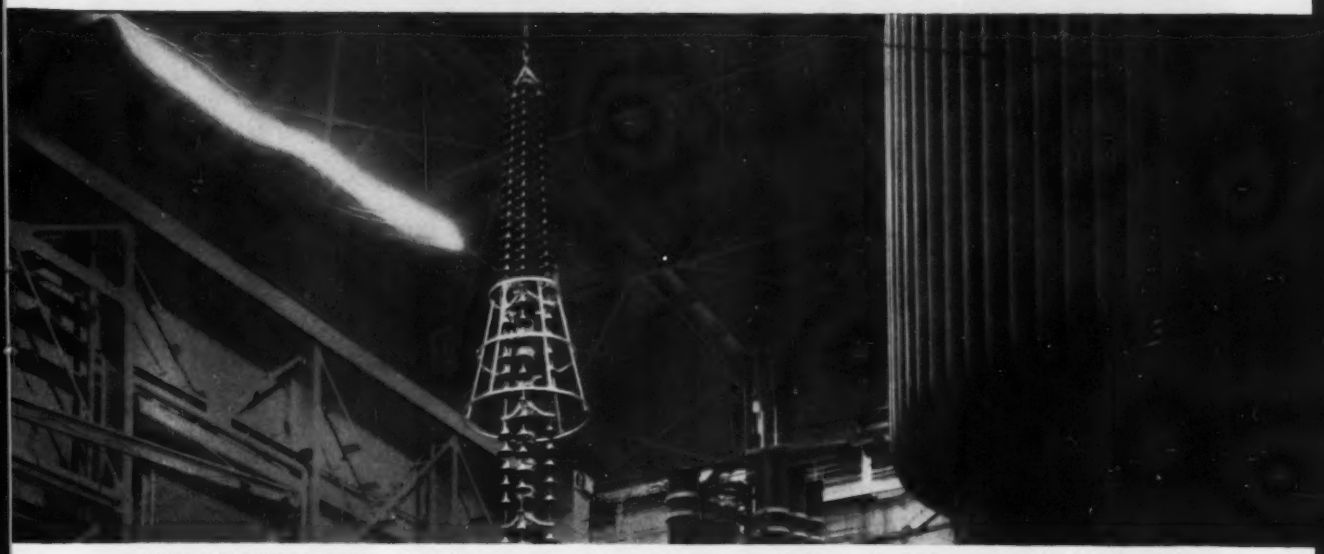
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T56-5



NEW "MAGNE-VALVE" ARRESTERS are inspected by W. J. Rudge (left), Manager Lightning Arrester & Cutout Engineering and R. T. Morris, Manager Lightning Arrester and Cutout Sales, on the floor of G-E High Voltage Laboratory, Pittsfield, Mass.



WORLD'S LARGEST ARRESTER—Thyrite* Magne-valve station-type arrester for 330-kv service defies repeated 7,500,000-volt strokes.

Out of this G-E laboratory came Magne-valve

Paving the way for Power Transformers insulated *two steps* down

Studies with 15,000,000-volt man-made lightning strokes continually yield new knowledge of lightning phenomena at General Electric's High Voltage Laboratory at Pittsfield, Massachusetts. Largest of its kind in the world, this laboratory is an outstanding reason why General Electric constantly sets the pace in producing new advances in lightning protective equipment.

Latest of these advances is a new line of station- and line-type arresters giving an unprecedentedly wide margin of protection—far beyond that of any other equipment of this type yet offered.

The reason is the exclusive "Magne-valve" principle developed in the G-E High Voltage Laboratory—a combination of *magnetic* action of series gaps and *valve* action of improved Thyrite disks.

"Magne-valve" gives as much as 20% more protection. In addition, you get three times greater discharge capacity, better ability to withstand high lightning currents, multiple strokes and long duration discharges. This extra margin of protection makes an important contribution towards today's constant efforts to protect system investment and to improve service continuity.

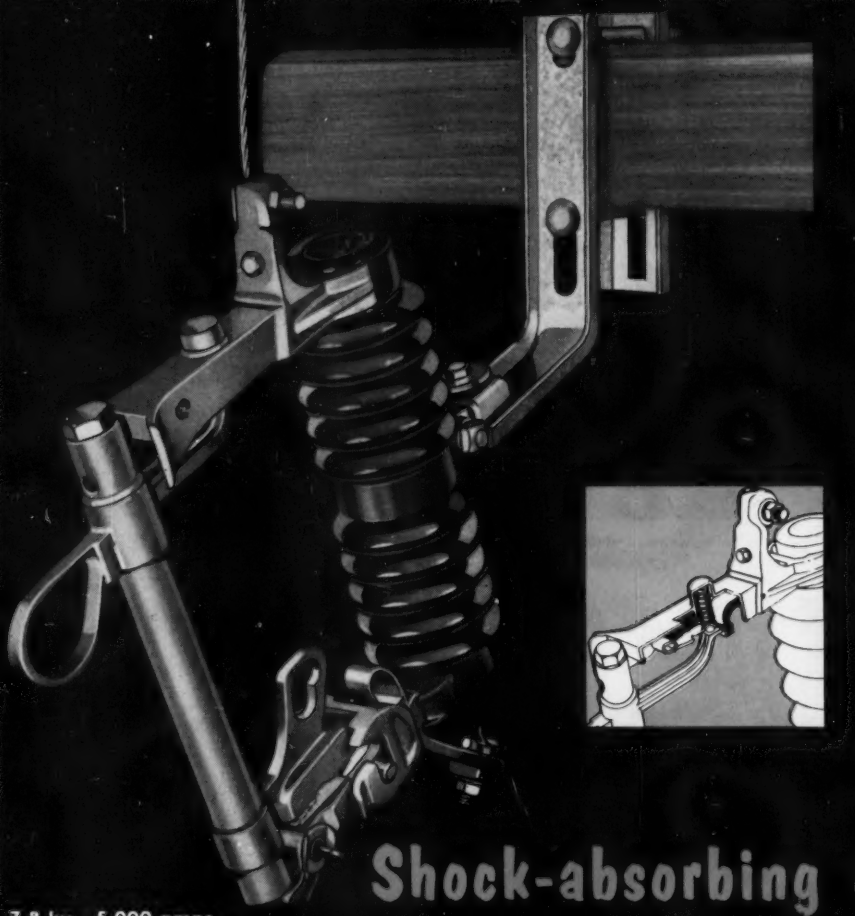
Now, Magne-valve allows insulation *two steps* down. The development of Magne-valve station-type arresters with superior protective characteristics opened the door of research toward power transformers insulated *two steps* below "Full B.I.L." (Basic Insulation Level). The availability of these transformers with attendant savings in cost and space requirements has recently been announced to the industry.

For assistance in making your choice of Magne-valve arresters, call your local G-E Apparatus Sales office, or write for Bulletins GEA-1304 (New Station Arrester) and GEA-2978 (New Line Arrester). General Electric Co., Schenectady 5, N. Y.

* Reg. Trade-mark of General Electric Co. 432-16

Progress Is Our Most Important Product

GENERAL ELECTRIC



7.8 kv—5,000 amps
15 kv—4,000 amps

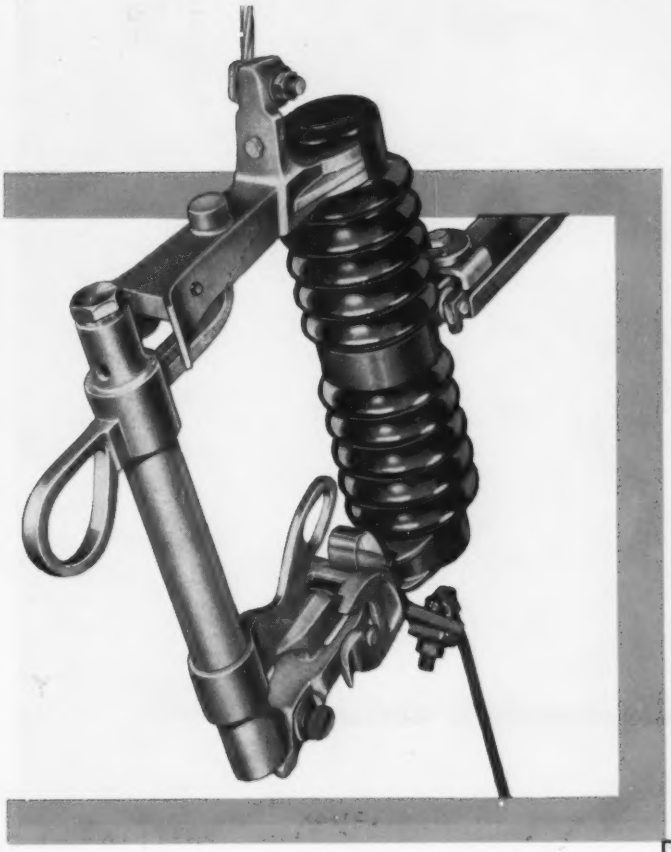
Shock-absorbing contact allows front venting... eliminates contact burning

ON THE HEAVY DUTY KEARNEY TYPE "G" TRIP-OUT

This exclusive Kearney shock-absorbing contact construction allows the fuse cartridge to be front vented. Burning gasses are directed harmlessly away from the contact. The recoil is absorbed by two-way stainless steel springs. The whole cutout is designed to "roll with the punch."

With no burning gasses or damaging shock against it, the top contact remains as strong and tight as new . . . even after interrupting many faults. Notice that the covered design of the contact provides plenty of protection against weather and foreign matter.

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVENUE · ST. LOUIS 10, MISSOURI
Canadian Plant: GUELPH, ONTARIO



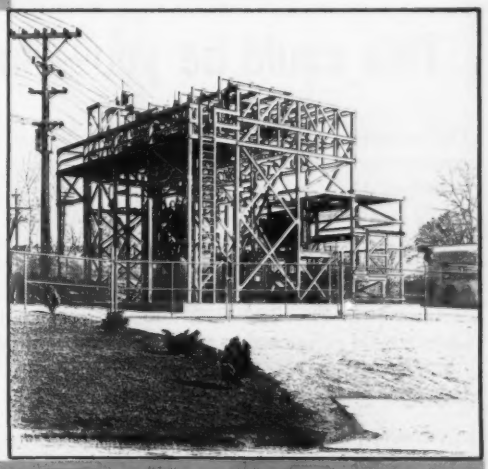
EXTRA HEAVY DUTY—Type "G"

7.8 kv—10,000 amps
15 kv—8,000 amps

Has the same advantages as the Heavy Duty Type "G" plus a more rugged fuse cartridge to withstand repeated high faults. Cutout is equally dependable for interrupting low current faults. Opening action causes the burned link to be "whipped" out . . . assuring a fast, complete interruption . . . without having to depend on expulsion force.

CUTOUTS FIELD TESTED . . .

Here at KEARNEY's 445,000 KVA Substation Laboratory all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings . . . not just theoretical calculations. You can be sure they will do the job they are supposed to do . . . with a generous margin of safety.



-310

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.
The Mark of Quality

KEARNEY PRODUCTS

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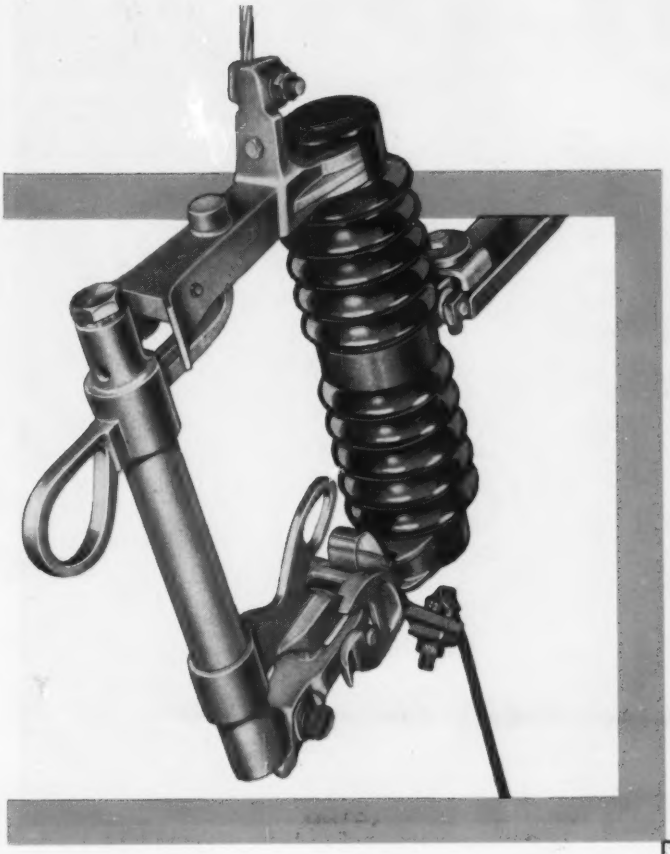

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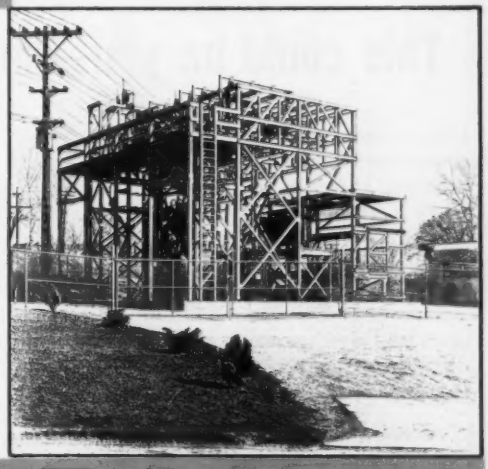


-310

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify
JAMES R. KEARNEY CORPORATION ST. LOUIS MO. GUELPH, ONT.
The Mark of Quality
KEARNEY PRODUCTS

This could be you—"In the Land of No Distributors."

Got an emergency? Want a switch in a hurry? Or some connectors? How about wire? "In the Land of No Distributors" there are no "over-the-counter" purchases and *hurry* is an unknown word. "In the Land of No Distributors" you couldn't pick up the phone nor could you send Harry or Mike out in the truck to pick up emergency requirements. If the switch or connector or cable manufacturer is in East Hoboken and you happen to be in Chicago you either wait a week or ten days or you make a flying visit to East Hoboken.

Not once, but many a day (and night).

In addition, "In the Land of No Distributors"—

- **You would be pestered by an army of Manufacturers' salesmen.**
- **Deliveries would be chaotic. You would get partial deliveries and wait days for "slow" manufacturers.**
- **You would have to carry a tremendous inventory and insure it.**
- **You would go "telephone crazy" placing hundreds of calls a day to a variety of different suppliers located miles away.**
- **Your "Order Department" and "Accounts Payable" Department would have to be increased a hundred fold.**

That's why dependable electrical manufacturers advise you to always buy from

YOUR DISTRIBUTOR—THE BEST FRIEND YOUR BUSINESS CAN HAVE! He's the *one* source for *everything* electrical—and he's local.

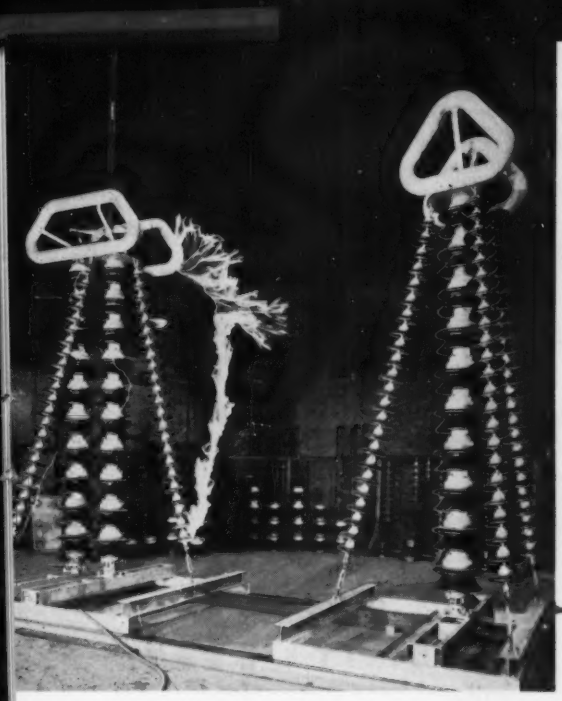
It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE ®

TRIANGLE CONDUIT & CABLE CO., INC.

New Brunswick, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases.

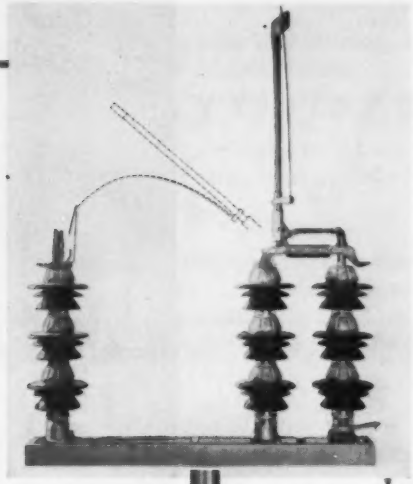
WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

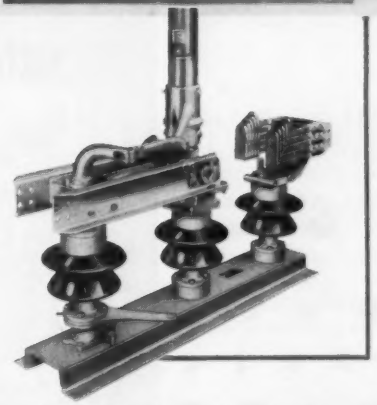


R&IE

Switch Development and Research looks HIGHER *and* HIGHER

SOLVING THE PROBLEMS OF TOMORROW





● HIGHER VOLTAGES

Over the High Voltage Horizon are the new operating characteristics of tomorrow's switch. Many factors associated with 400 Kv., or 500 Kv., such as insulation, break distance, corona shielding, R. I. V., all weather operation, and general refinement are constantly being investigated.

● HIGHER INTERRUPTING CAPACITIES

An increasing variety of air switch attachments are continually being perfected to increase the usefulness of air switches. The "Arc Restrictor" shown is one of several types for interrupting line charging current. Others for interrupting full-load current, isolating capacitor banks or for switching parallel loads, are available.

● HIGHER CURRENTS and MOMENTARIES

Increased short circuits and higher fault currents are more important than ever before. The new straight-line current path design of Hi-Pressure Contact Jaws and Sealed Pressure Hinge Contacts is the answer to these problems.

R&IE Research and Development constantly evaluates the many possible design problem solutions to improve switching performance on the nation's expanding power lines. The new and larger R&IE laboratory facilities will give you a better guarantee of good performance and improved quality switching equipment.

●

R&IE EQUIPMENT DIVISION

I-T-E Circuit Breaker Co.

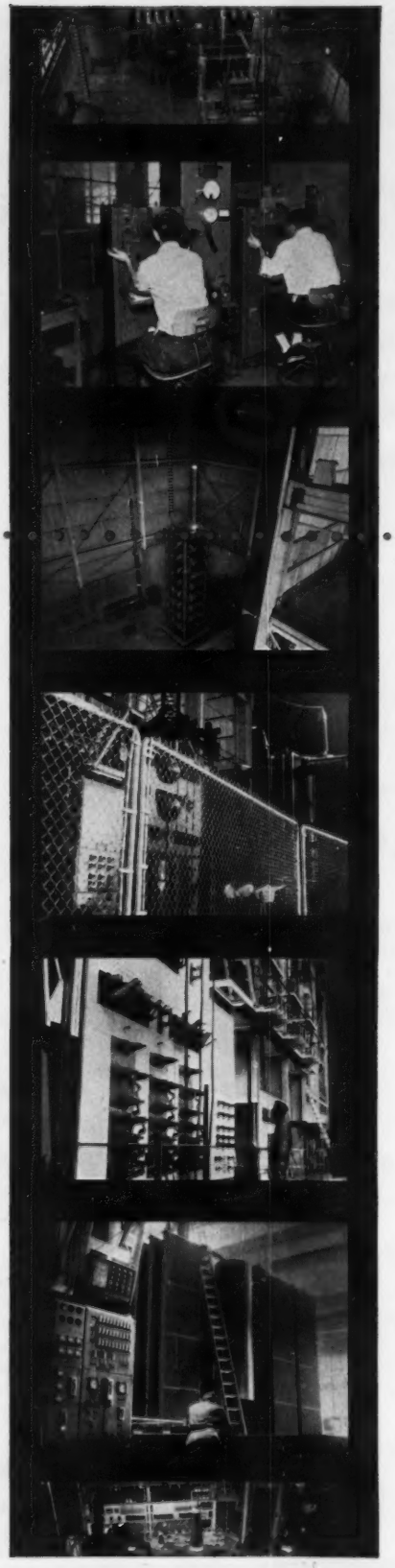
GREENSBURG, PENNA.

STRUCTURES—steel or aluminum ● TESTING DEVICES ● KIRK KEY INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and AIR SWITCHES ● SUBSTATION

MOLONEY

PERFORMANCE



DEPENDABILITY . . . . . AT ITS BEST!

Regardless of how impressive a transformer appears . . . it must perform . . . and perform as the purchaser wants it to. To insure this performance . . . under all operating conditions . . . extensive test facilities are necessary.

Here at Moloney, such test equipment to satisfy any purchaser is available . . . Moloney has the test equipment necessary to prove product performance . . . to your satisfaction.

Specify Moloney . . . "Dependability at its Best!"

MESS-12

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

ELECTRICAL BUSINESS OUTLOOK

Electrical World
MARCH 5, 1956

President Eisenhower's second term decision improves industry outlook. Business has more confidence in going ahead with expansion plans. Stock market activity showed this. It means higher equipment sales to industrial companies and resultant business for utilities.

• • •

Industry's reserve margin heads for tighter squeeze. If weather and business conditions of 1955 repeat, the margin between capability and peak load in December could be down to 17.5%, a shade under the 17.9% actual margin last December. Right now industry forecasts show expected reserves of 19.3%, but the delays in some planned capacity additions and probable additional load growth will reduce this margin.

• • •

Weather conditions weigh more heavily in peak load forecasts. Industry forecasters have generally accepted a 2% plus or minus variation in their estimates for unusual weather conditions. Now it appears that a wider variation should be allowed. Note that the hard winter weather in Region 1, the Northeast, last December sent peak loads 3.7% above industry estimates. In Region 2, Central Industrial, actual peak was 2.4% above estimates, again partially due to unusual weather.

• • •

Copper prices to remain firm with supplies still tight. The trade doesn't anticipate any change in supplies before midyear at best and possibly not until the end of 1956. Boosts in copper wire and cable prices follow rise of refined copper costs. World copper prices, consistently above those in the U. S., helped force the recent price rise.

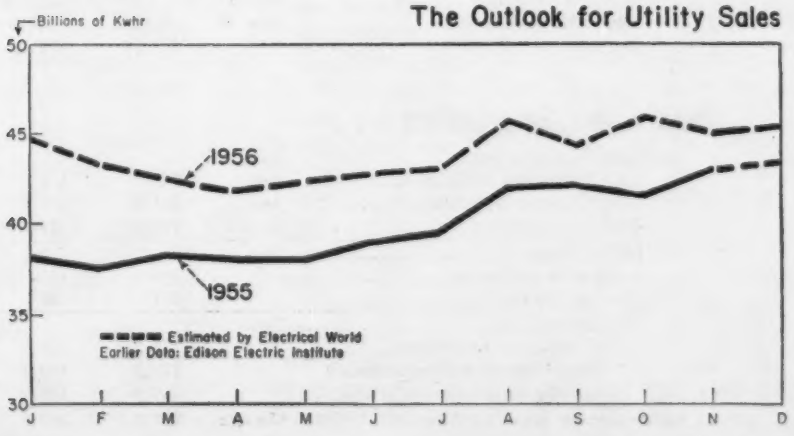
• • •

Lead prices up. European suppliers have raised prices 2¢ a lb this year and apparently made them stick. U. S. suppliers raised prices 1¢ a lb in December but trimmed them back ½¢ in January. If the European price boost holds a few more months, look for another rise here.

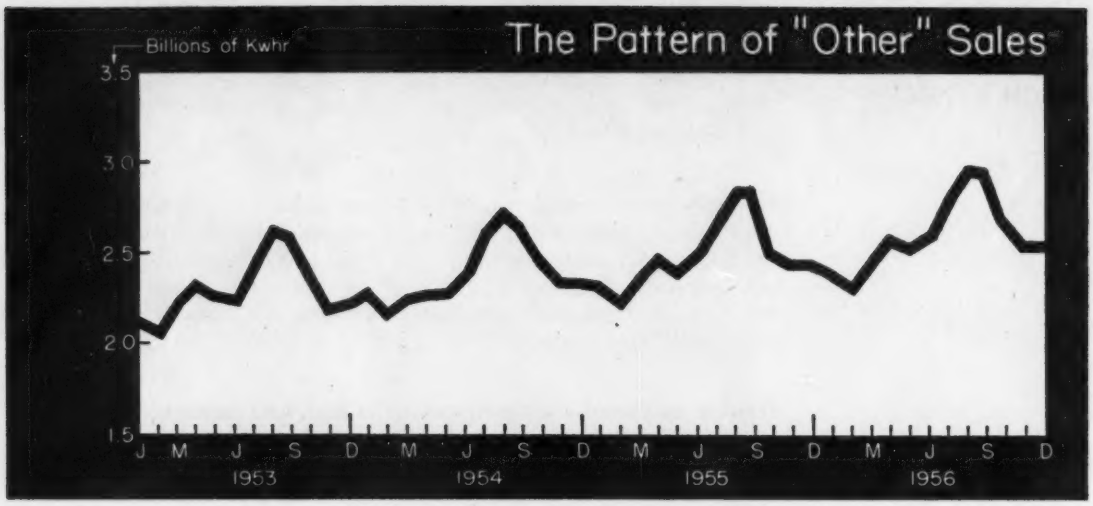
• • •

Truck prices down; passenger car prices revised. General Motors is shaving prices by reducing "destination" charges by as much as $52 on light trucks and $111 for medium trucks. Actual reductions depend on distance from plant. GM announced price increases for cars, but some of these will be offset by the lower "destination" charge. Ford led the way a week earlier. Chrysler followed.

The Outlook for Utility Sales



STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Dec.	114.37	113.55	102.59	11.5
Peak—Class I Systems, million kw	Dec.	98.2	96.4	85.7	14.6
Estimated Dec. '56 Peak, million kw	Dec.	105.27	104.55	102.64	2.6
Production—billion kwhr	Dec.	50.72	47.76	43.45	16.7
Hydro		9.31	9.21	9.05	2.9
Fuel		41.41	38.54	34.38	20.4
Sales—billion kwhr	Nov.	43.07	43.16	36.29	18.3
Residential		10.71	10.33	9.72	10.2
Commercial		6.61	6.87	6.08	8.7
Industrial		23.37	23.45	18.26	28.0
Other		2.38	2.51	2.23	6.7
Fuel Consumption	Dec.				
Coal—million tons		14.77	13.29	11.91	24.0
Oil—million barrels		8.54	7.10	7.69	11.1
Gas—billion cu ft		70.00	82.26	74.85	−6.5
Net Income Class A & B Co's—$ million	Nov.	104.29	95.67	95.12	9.6
Residential Customers—millions	12 mos.	44.30	44.21	43.04	2.9
Revenue per kwhr	ended	2.65¢	2.65¢	2.70¢	−1.9
Avg kwhr per customer	Nov. 30	2,728	2,715	2,529	7.9
Avg annual bill		$72.29	$71.95	$68.28	5.9

Business Statistics . . .

Indexes: 1947-49 = 100					
FRB Industrial Production	Jan.	143	141	132	8.3
ENR Construction Cost	Jan.	141.8	141.1	135.1	5.0
BLS Cost-of-living	Jan.	114.6	114.7	114.3	0.3
NEMA Sales	Dec.				
Insulation materials		160	155	138	15.9
Electric appliances		101	88	74	36.5
Wholesale prices	Dec.				
Motors and generators		127.2	127.0	121.8	4.4
Transformers and regulators		129.2	129.2	128.1	0.9
Switchgear and fuses		145.9	145.9	135.3	7.8
GNP—annual rate—$ billion	4th Qtr.	397.3	392.0	367.1	8.2

Your Business

"Employ thy time well if thou meanest to gain leisure; and since thou art not sure of a minute, throw not away an hour." Written about 200 years ago by Benjamin Franklin, these words have more meaning today than ever before. Asked to name his most important possession, John D. Rockefeller once said: "Time!" Many important people would give the same answer. And most of them know how to make every minute count.

In his book, "How to Gain An Extra Hour Every Day," (E. P. Dutton & Co, $2.95), author Ray Josephs, a public relations executive, recounts how many of America's top leaders make the best use of their time and how we can do the same. These people, and also most efficiency experts, ask themselves four basic questions:

1. Are there any details on my job I can eliminate or simplify?
2. Can I combine two or more tasks, getting both done in less time than if they were done separately?
3. Can I rearrange the order in which I perform the steps in my job?
4. Can I use a better put-away system to save time on the make-ready of the next job?

Here are some more tips from Josephs' research: Don't spend time when your mind is freshest on routine work. Keep your work area neat. Have your eyesight checked. Poor vision can slow you up, tire you quicker than normal. Let machines do as much work for you as possible. Acquire an effective method for cutting short time-consuming visits from talkative co-workers.

These are some techniques used by famous people, reports Josephs: Dr Daniel Polling, world-famous clergyman and author, divides his day into 15-minute segments. Into these he tries to compress what might have taken 20 or 30 minutes. The method can be adapted to your own needs—set whatever goals you want, but having set them, stick to them. Results can be surprising.

Adm Robert B. Carney's system is to "detour the details." But maybe you're the assistant to whom the details are detoured. In that event devise a system to be your "assistant." A group of folders on your desk with each day's accumulation in proper order can save countless minutes searching for this or that paper.

Henry Ford II plans his work as much as a month ahead. Constant checking on what he's accomplished against what he expected to get done helps him to eliminate time-devouring detail.

"The gloves? Oh I just happened to see an ad for them."

Your Health

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

Many people considered him successful. He was chief executive officer of a large, well-known firm. He had money in the bank, a fine home in an exclusive suburb, a winter place in Florida, and several expensive cars. He also had a long-standing, chronic constipation, a recurring duodenal ulcer, and high blood pressure. He was a scared, flabby, pallid, 53-year old man lying in a hospital bed under an oxygen tent.

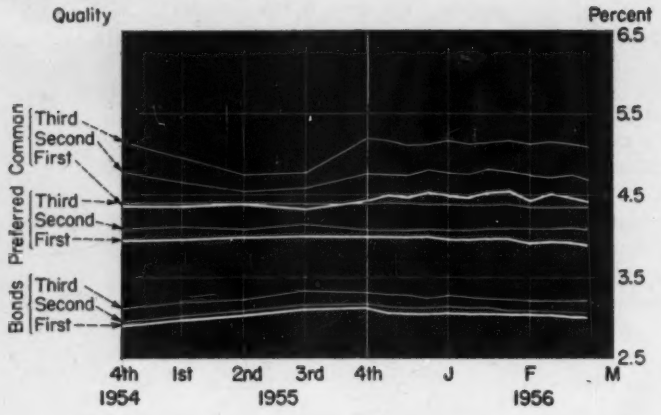
He was tortured by severe vise-like pains in his chest, and he was gasping for breath. His "heart attack" was a severe one and like all his other ailments was the probable result of an over-worked, over-strained nervous system.

The money he had accumulated afforded him a private hospital room, private nurses, and the best physicians. It also afforded him an engraved metal casket and an elegant hand-carved grave stone as well as a well-dressed widow. His son came down from an Ivy League college to mourn the passing of a man he had hardly known. Business, you see, came before home or family.

The funeral was a well-attended social success. His friends expressed sorrow over his death. Some of his business associates thought his death was poorly timed and inconsiderate. Very few people thought it could ever happen to them. One did say that maybe he should have a medical checkup sometime.

A publicly labelled successful man had come and gone. He had over worked, over eaten, over played, in fact—he had over lived. If you think he was successful, it is really not very hard to be like him. Money and success are sometimes boon companions of ulcers and high blood pressure. Why settle for 50 years when you could have 100?

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY.....	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Feb. 23.....	3.02	3.06	3.20	3.92	4.09	4.38	4.45	4.70	5.12
Feb. 16.....	3.02	3.07	3.20	3.93	4.10	4.38	4.49	4.74	5.13

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Cincinnati Gas & Electric.....	12	Dec.	$14,032,854	$12,791,356	$1.90	$1.72
Florida Power Corp.....	12	Dec.	6,941,249	6,143,599	2.30	2.22
Wisconsin Public Service.....	12	Dec.	5,221,419	4,667,621	1.74(a)	1.57(a)

Note—All the figures shown above have been audited; (a) Based on average shares outstanding.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
FEBRUARY 23-29			
BONDS			
Kansas Gas & Electric—1st mtg 3¼% due 1986.....	$7,000	102.384%	3.25%
Texas Electric Service—1st mtg 3¼% due 1986.....	10,000	101.93	3.15
Southwestern Public Service—1st mtg 3.35% due 1981	10,000	100.25	3.335
PREFERRED STOCK			
Northern States Power—100,000 sh $4.16 $100 par cum	$10,000	$101.75	4.09%
Southwestern Public Service—120,000 sh 4.40% $25 par	3,000	25.00	4.40
COMMON STOCK			
Southern Indiana Gas & Electric—83,030 sh (being offered commonholders on 1-for-11 basis, record Feb. 21 to expire Mar. 8).....	$2,366	$28.50	5.61%
Kansas Gas & Electric—200,000 sh.....	5,175	25.875	4.64
SCHEDULE FOR MARCH			
BONDS			BID DATE
Mississippi Power—1st mtg due 1986.....	$4,000	.....	Mar. 1
Houston Lighting & Power—1st mtg due 1986.....	30,000	.....	Mar. 7
Alabama Power—1st mtg due 1986.....	14,000	.....	Mar. 15
Narragansett Electric—1st mtg due 1986.....	10,000	.....	Mar. 20
Pacific Gas & Electric—1st mtg due 1986.....	25,000	.....	Mar. 20
Georgia Power—1st mtg due 1986.....	12,000	.....	Mar. 29
PREFERRED STOCK			
Mississippi Power—40,000 sh $100 par.....	$4,000	.....	Mar. 1
Louisiana Power & Light—70,000 sh $100 par.....	7,000	.....	Mar. 20
COMMON STOCK			
Northern States Power—670,920 sh (to be offered commonholders on 1-for-20 basis, record Mar. 1 to expire Mar. 20).....	$11,238	$16.75	5.37%
Oklahoma Gas & Electric—298,479 sh (to be offered commonholders on 1-for-10 basis, record Mar. 8)..	.....	.....	.....

FINANCIAL BRIEFS

Utah Power & Light Co has reported earnings per share of $3.10 in 1955 as compared with $2.88 in 1954. E. M. Naughton, president and general manager, has advised stockholders the company continues to earn less than 6% return on investment.

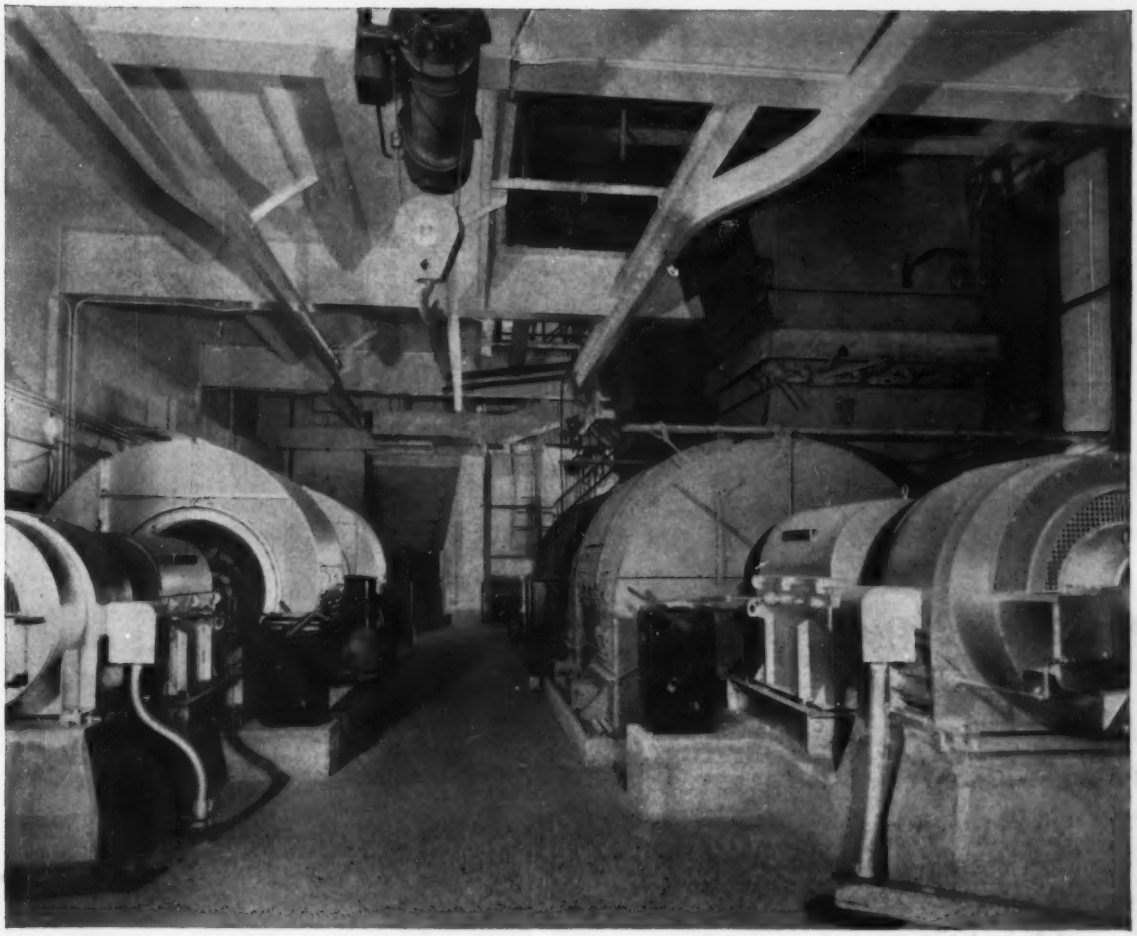
Secondary Offerings—Kidder, Peabody & Co has placed 120,000 common shares of Detroit Edison Co . . . Granberry, Marache & Co has sold privately $3 million Duke Power Co first and refunding mortgage bonds 2.65% series, due 1977.

South Carolina Electric & Gas Co will pay April 2 a quarterly common stock dividend of 25¢ a share as compared with 22½¢ a share in the previous quarter . . . **Hawaiian Electric Co, Ltd,** is planning to declare a 10% stock dividend subject to approval of stockholders at the annual meeting on March 20 and the public utility commission.

Maryland General Assembly has received a measure which provides for taxing public utilities according to the city or county where its property is located rather than where it maintains its office headquarters. The same proposal was defeated the past two years. Its basic result would be to sharply reduce the personal property tax revenues from utilities in Baltimore City, Wicomico, and Frederick Counties.

Pend Oreille County Public Utility District, Newport, Wash., has refinanced its Box Canyon Dam project as part of an agreement under which it sells surplus power from the new dam to Seattle City Light. It has been paying 4 to 6% interest on the bonds, previously held by the Reconstruction Finance Corp. An investment syndicate, headed by Foster & Marshall of Seattle, bought the outstanding bonds, amounting to $23,935,000, at a rate of 3.2394% for a 50-year maturity.

Salomon Brothers & Hutzler has formed a syndicate comprising Smith, Barney & Co, Blyth & Co, Halsey Stuart & Co, J. C. Bradford & Co, and Equitable Securities Corp to sell more than $130 million worth of revenue bonds to finance the proposed Memphis, Tenn., electric power plant.



4 MORE "BUFFALO" FANS DELIVER 688,000 CFM POWER PUNCH

at Encina Station of San Diego Gas & Electric Co., Carlsbad, Calif.

FORCED AND INDUCED DRAFT

The two "Buffalo" Double Width Fans on the left deliver up to 137,500 cfm combustion air. On the right are two "Buffalo" I.D. Fans (capacity, 206,500 cfm) discharging the boiler gases to the chimney.

Call on "Buffalo" know-how and equipment for satisfaction in any mechanical draft problem you may have. Your nearby "Buffalo" Engineering Representative is ready and qualified to help you.

Write for full details today!

"Buffalo"

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Telephone installations show...

How Polyethylene performs in the field

WASHINGTON – Polyethylene-covered cable was first installed in this mountainous region of the Pacific Northwest in 1950. Field experience showed that it was adaptable to any method of hanging and required no special equipment. Installation could be made on existing pole arms without increasing crossarms, pole height, or tree trimming.

The line has withstood extremely heavy snow and ice loading in certain mountain and valley sections. There has been no deterioration despite temperatures 40 deg. below zero. During the summer months, temperatures up to 115 deg. and exposure to sunlight have had no discernible effect.

NEW YORK – Recently, 33,000 feet of cable and 75,000 feet of wire, both insulated with polyethylene, were put into service in upstate New York. Although an unusually large number of thunderstorms were experienced during the year, no lightning damage was reported on these lines. To date, rain conditions have had no effect.

Much of the cable was strung on existing poles, but in the construction of new lines it was found practical to use ⅓ fewer poles. The need for crossarms and tree trimming was also reduced. As a result, maintenance costs in rural areas have stayed low.

YEARS of service under a variety of terrain and climatic conditions are represented by these field reports from the telephone industry. They describe the performance of BAKELITE Brand Polyethylene used as jacketing and insulation for wire and cable.

In every instance, BAKELITE Polyethylene has brought improvements over conventional materials. Its superior moisture resistance has set a new standard in trouble-free operation. Its extremely light weight has saved time and expense in installation. Its toughness has made cable handling easier. Its excellent dielectric strength has far exceeded the needs of telephone service.

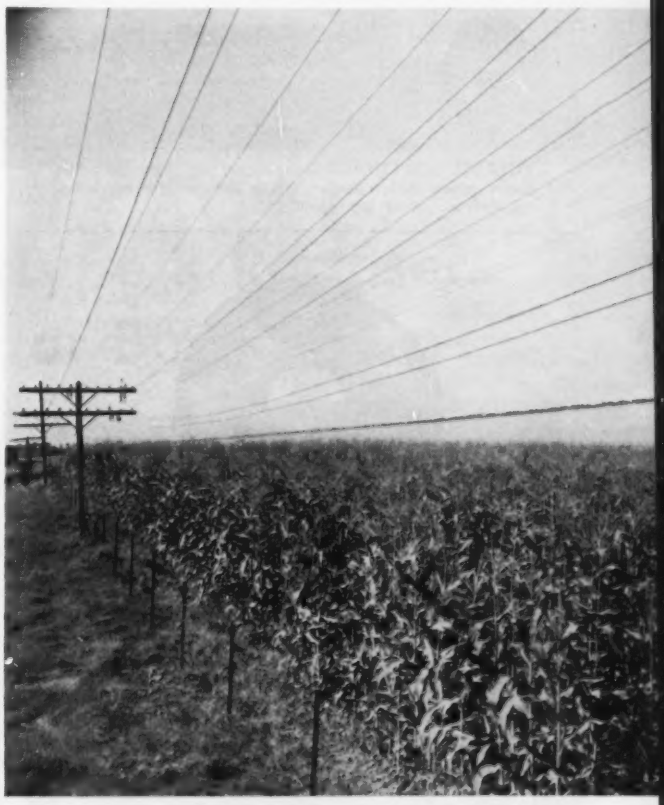
Your own operations may profit from these examples. Wire and cable construction in many fields has been notably improved through the use of BAKELITE Polyethylene . . . for example, control cables for fire alarm, traffic, and railway signals . . . utility line wire and service drop cable . . . power cable . . . and coaxial cable. Write for further information on its properties.

BAKELITE
BRAND
Polyethylene Plastic

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

PENNSYLVANIA – Polyethylene has stood up under exhaustive indoor and outdoor tests carried out in western Pennsylvania during the past year. It has effected such savings in installation costs that it will be a major item in purchases for the coming year.

With respect to service life and safety, polyethylene is considered an outstanding improvement over other materials. It has shown unusual resistance to weather and abrasion. Its extremely light weight permits a smaller cable construction that is easier to handle, making for faster installations. It also permits wider pole spans, with a consequent saving in poles and maintenance.



ILLINOIS – Cable with polyethylene insulation and vinyl plastic jacketing has been used in Central Illinois since 1953. Its light weight has resulted in a 5-ft. reduction in pole height, elimination of guy wires and messengers, faster handling of cable, and wider spacing of poles.

Excellent results are reported with spans of 400 feet, compared to the 240-ft. spans needed with conventional cable. The light weight and high strength of the cable assembly are particularly important in winter, lessening the damage from ice and sleet loading. Because of its high dielectric strength, polyethylene now replaces fabric on circuit wiring.

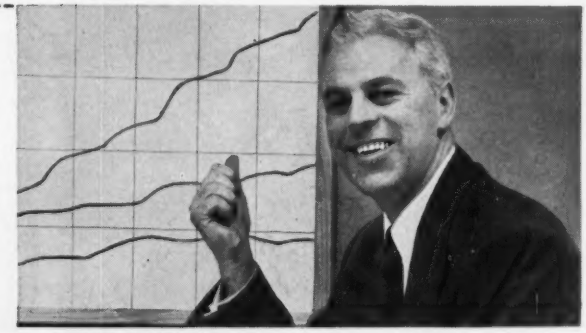
Look at the extras in Plymouth's low fleet price!

1. EXTRA BEAUTY. Plymouth is the *only* low-price car to bring you *really* new styling for '56 — tomorrow's look *today!* Reflects your company's good judgment!

2. EXTRA SIZE. And Plymouth is the *biggest* car of the low-price three, inside and outside — giving drivers greater riding comfort, more carrying capacity.

3. EXTRA ECONOMY. You're in for extra thousands of thrifty, trouble-free miles from Plymouth's always-reliable V-8 and 6 engines, and rugged chassis and body.

4. EXTRA SAFETY. As always, Plymouth offers many exclusive safety features. Plymouth's front brakes, for instance, have two cylinders, where other low-price cars have only one.



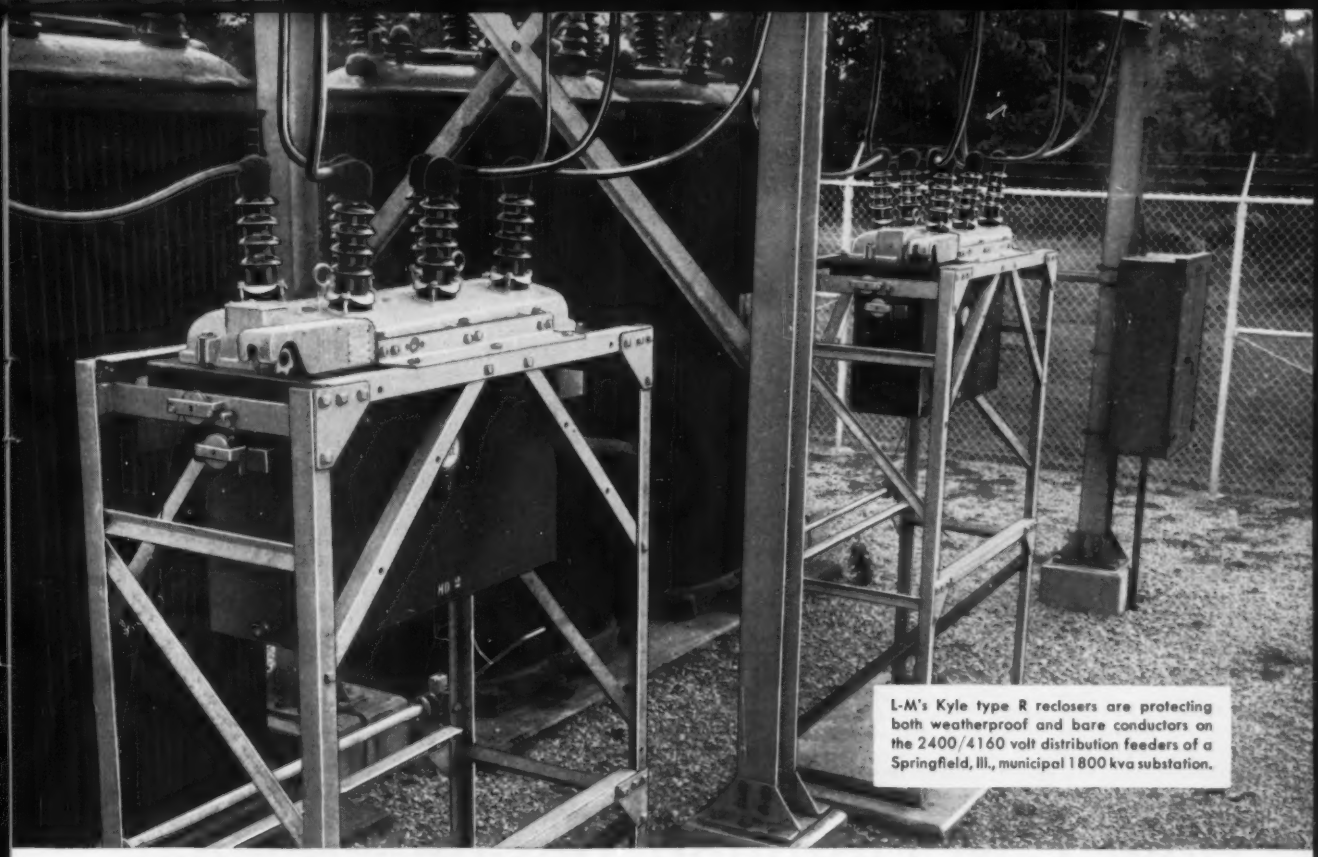
5. EXTRA RESALE VALUE. Looking ahead to trade-in time, you'll find Plymouth brings the highest resale price in its field. Official N.A.D.A. figures prove it, over and over.

6. EXTRA ATTENTION TO YOUR ORDER. Your order will be built on *time* to *your* specifications — under Plymouth's Custom Fleet Plan. All these extras at such a low fleet price!

best buy for all fleet operations

PLYMOUTH

See your Plymouth dealer today!



L-M's Kyle type R reclosers are protecting both weatherproof and bare conductors on the 2400/4160 volt distribution feeders of a Springfield, Ill., municipal 1800 kva substation.

Improve Service Continuity . . .

High-Speed Kyle Type R Reclosers Reduce Conductor Burn-Down

by **FRANK McSTAY**
Product Manager
Kyle Products
Line Material Company

The operating speeds of conventional circuit breakers in many cases do not interrupt transient faults fast enough to prevent burn-down of weather-proof conductors or loss of mechanical strength of bare conductors. For this reason, Line Material Company engineers have designed fault-protective devices with extremely fast opening characteristics that will *minimize permanent system faults* resulting from transient or non-persistent causes.

Reduce Damage Caused By Transient Faults

L-M Kyle reclosers are completely automatic and self-contained. They provide high-speed circuit clearing (2-cycle maximum). Up to 90% of transient or non-persistent faults can be cleared by Kyle reclosers with no significant damage to the system or interruption of service continuity.

Ratings from 25 to 400 Amps.

The Kyle type R heavy-duty three-phase oil circuit recloser, shown above, is designed to replace breakers in substations with up to 100,000 kva fault capacity. They are available in normal load ratings from 25 to 400 amperes, with symmetrical RMS interrupting rating up to 6000 amperes at 4.8 kv and below and 4000 amperes up to 14.4 kv.

Almost any supplementary relaying scheme is adaptable to the type R recloser for substation application. Units are available with ground tripping, shunt tripping, shunt lockout, and auxiliary switches for remote control indication or low-voltage control switching.

Kyle Type R 3-Phase Reclosers available in normal load ratings FROM 25 TO 400 AMPERES

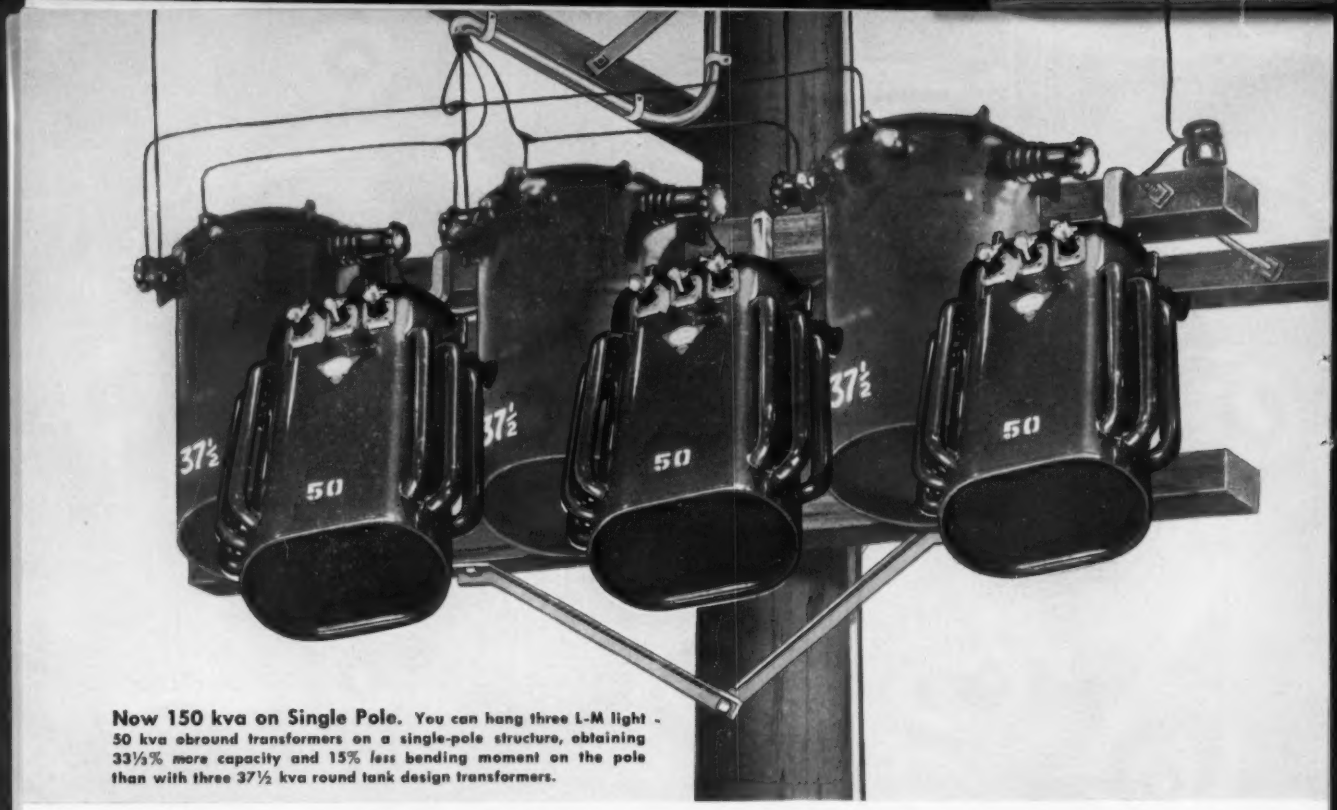
Ratings Amps.	Min. Trip Amps.	Inter. Ratings RMS Amperes 4.8 kv	14.4 kv
25	50	1500	1500
35	70	2100	2100
50	100	3000	3000
70	140	4200	4000
100	200	6000	4000
140	280	6000	4000
160	320	6000	4000
185	370	6000	4000
225	450	6000	4000
280	560	6000	4000
400	800	6000	4000

Get the Whole Story On L-M's Kyle Reclosers and Sectionalizers

Ask your L-M Field Engineer for information and bulletins on Kyle apparatus and complete coordination—single and three-phase—from substation to load. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto, Ontario.

248

LINE MATERIAL Kyle® Reclosers
A McGRAW ELECTRIC COMPANY DIVISION



Now 150 kva on Single Pole. You can hang three L-M light - 50 kva obround transformers on a single-pole structure, obtaining 33⅓% *more* capacity and 15% *less* bending moment on the pole than with three 37½ kva round tank design transformers.

How L-M Obround Design Provides Additional Capacity On Structures

New obround tank design is smaller, lighter, has shorter moment arm, retaining all outstanding Round-Wound® performance characteristics.

By **ALVIN B. COYLE**
Product Manager
Transformers
Line Material Company

Now you can hang transformers of larger capacity on a pole structure with L-M's lighter, smaller obround transformer tank design. The additional capacity is obtained without changing outstanding performance characteristics of L-M's Round-Wound design.

Less Weight

The obround design provides a smaller tank with less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where necessary to provide the cooling surface for maintaining the same low hot-spot and top oil temperature-performance characteristics found in all other L-M transformers. In addition, the transformer's repetitive overload capacity is improved as the result of the faster transfer of heat from the coils to the cooling air.

Shorter Moment Arm

L-M's new obround design brings the center of gravity closer to the pole, which reduces the moment arm distance from the pole. The combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole and crossarms, and thus greatly increases the potential capacity of all your transformer structures.

You can take advantage of savings such as these:

Larger transformers can be hung closer to the top of the pole, eliminating the need for a higher pole and additional spacing.

Single-pole, three-phase transformer structures can now serve more load with the additional transformer capacity available. New 50 kva obround transformers have less bending moment on the pole and on crossarms than previous 37½ kva round tank design. Here L-M's light obround transformers may eliminate the need for costly two-pole structures.

Pole-Mounted 167 kva Transformers

L-M's light-weight 167 kva transformer can be pole-mounted; provides a full 167 kva of capacity on a single-pole structure. And it, too, provides L-M's well-known overload capacity.

To serve three-phase loads you can hang three L-M light 167 kva transformers or 500 kva on a two-pole structure, eliminate expensive platforms, ground pads, or vaults in many instances, and make further use of existing facilities.

L-M's light, obround design transformers are available in single-phase 5 kva through 167 kva in each standard distribution voltage class.

Get Details On Lighter-Weight Obround Transformers

Ask the L-M Field Engineer for application information, weights and dimensions on L-M obround transformers and the exclusive Round-Wound design. Or write Mr. Coyle at Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

219-A

LINE MATERIAL *Transformers*

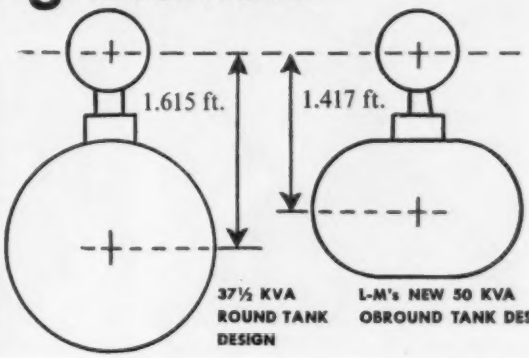
You Can Hang 33⅓% More Capacity With 15% Less Bending Moment

COMPARE 37½ kva round tank design
50 kva L-M obround tank design

37½ kva ROUND tank design:
Moment arm from center of pole. 1.615 ft.
Weight. . . . . 800 lbs.
Bending moment 800 x 1.615. . . . **1292 ft.-lbs.**

50 kva L-M OBROUND tank design:
Moment arm from center of pole. 1.417 ft.
Weight. . . . . 775 lbs.
Bending moment 775 x 1.417. . . . **1098 ft.-lbs.**

L-M's new 50 kva obround transformer has 15% less bending moment than the 37½ kva round tank design.



Less Bending Moment—New obround tank design reduces the moment arm distance from the pole. The combination of lighter weight and smaller moment arm distance greatly decreases the total bending moment on the pole. When crossarm mounted, the lighter weight substantially reduces the bending moment on the crossarms.

Less Weight, Faster Cooling—The obround design affords a small tank and less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where required to provide sufficient cooling surface.

In addition, oil ducts, located throughout the coil and between the coil and cruciform cross-section of the wound core, contribute to uniform efficient cooling.

Rapid transfer of heat provides faster cooling of the unit, increasing its repetitive overload capacity.

Plus Outstanding Round-Wound Performance Characteristics

Both the physical and performance characteristics of L-M's obround tank transformer were considered in detail. The advantages of lighter weight and shorter moment arm were accomplished with no sacrifice of outstanding Round-Wound performance characteristics.

Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.

High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage windings and the core. This permits ample creepage distance with generous insulation.

High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

High Short-Time Overload Capacity: cruciform cross section of wound core and ducts between windings and layers provide excellent cooling for the entire unit.

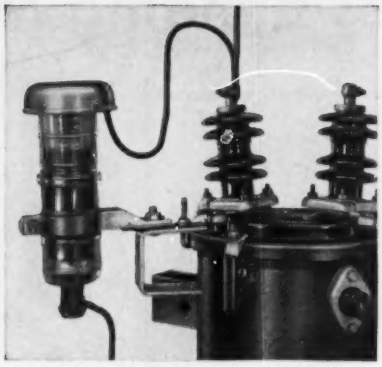
Now you can hang 167 kva directly on the pole, yet L-M's new lightweight obround has full 167 kva continuous rating and no sacrifice in overload capacity.

LINE MATERIAL
LM
Transformers

219-R2

These Companies Switched to Valve Arresters

Company A, formerly a strong proponent of expulsion type arresters, recently decided not only to switch to valve type, but also now has crews replacing every expulsion arrester on the system.



Company B, a large user of protected transformers, decided to switch to valve type arresters; will no longer buy protected transformers unless they are equipped with valve arresters.

Company C was having trouble protecting equipment with expulsion arresters. At the recommendation of L-M engineers, the company has switched to valve type, has had no more trouble.

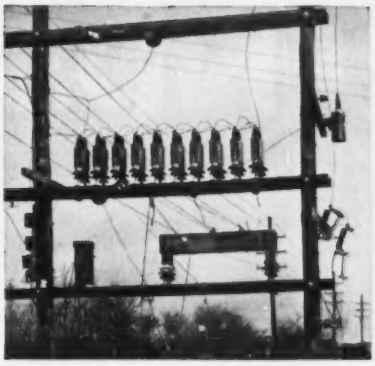
Valve Arresters Are Better

Valve type arresters give better protection, are not limited by system capacity, permit better fuse coordination, and last longer than expulsion arresters.

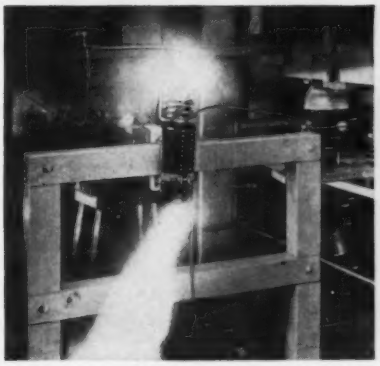
LM®

LINE MATERIAL

These Companies Prefer Valve Arresters



Company D conducted extensive tests of lightning arresters in its own special field laboratory, to prove that expulsion arresters were satisfactory. But the evidence was the other way; the company continues to use valve arresters exclusively.



Company E was having a large number of outages caused by blown fuses. L-M engineers worked with the utility engineers to locate the cause—traced the fuse blowings to expulsion arresters.

Company F was experiencing an increasing and excessive number of recloser operations. The cause was high follow current passed by expulsion arresters, according to a 2-year study. They are now considering standardizing on valve arresters.

Than Expulsion Arresters

Here's Why...

by **GEORGE W. COOPER**
Product Manager
Protective and Power
Switching Equipment
Line Material Company

As a major manufacturer of both valve and expulsion type distribution lightning arresters, L-M is frequently asked—"Which arrester principle is best for my system?"

The question is not a new one. It originated with the advent of the expulsion arrester. At that time, about 25 years ago, utilities were finding moisture, a result of improper sealing, the cause of many valve arrester failures. For this reason interest developed in the expulsion arrester principle. However, in more recent years, positive sealing of the valve arrester has been achieved.

This and other important improvements have been thoroughly tested and proved by operating companies. Field experience has provided the answer: *valve arresters are better than expulsion arresters.*

Regardless of differences in design by various manufacturers, there are certain basic differences in the valve *principle*, as compared with the expulsion principle.

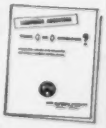
The valve arrester operates on the principle of a valve, which "opens," with low resistance to high voltage, high current lightning surges, and "closes," with high resistance to 60-cycle follow current.

The expulsion arrester operates on the pressure principle, of expelling the power follow current arc. For this purpose a fibre tube must be used to form the gases which expel the arc—and this fibre is subject to erosion—and changing characteristics. These limitations apply regardless of differences in design, manufacture, etc.

Listed at the right are four principal reasons why we recommend valve type arresters over expulsion arresters.

Get Complete Information

Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet ("Valve versus Expulsion Arresters"). Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Div.)



FOUR PRINCIPAL REASONS for recommending valve over expulsion type arresters

1 Better Protective Characteristics—The valve arrester sparks over more quickly and at lower voltages on lightning surges. Transformer end turns are not stressed by a complete voltage collapse following sparkover. Although the expulsion arrester provides a satisfactory level of protection for most transformers, a higher degree of protection is available through the proper application of valve arresters.

2 Unlimited 60-Cycle Capacity—The application of the valve arrester is not limited by the available short-circuit current. The expulsion arrester, operating on a pressure principle, has a definite top limit and may have a bottom short-circuit current rating. (Too much current causes it to explode; too little fails to expel the arc.)

3 No Fuse Coordination Problems—The valve arrester will pass relatively small values of 60-cycle follow current, regardless of system capacity. Expulsion arresters can pass high follow current, which may cause unnecessary operations of sectionalizing devices.

4 Longer Life—The valve arrester is electrically and mechanically unaffected in handling lightning discharges usually encountered in service. Its life is relatively unlimited. The expulsion arrester ages and changes its characteristics, because atmospheric conditions and erosion due to operation affect the fibre.

POWER TRENDS..

ANOTHER COMBUSTION "FIRST"

1955 saw the completion of the first utility boiler to be erected with prefabricated furnace wall panels. Cromby Station, Philadelphia Electric Company.

●●● as revealed by 1955 orders for **C-E UTILITY BOILERS**

Orders placed for C-E Utility Boilers in 1955 were of such volume and diversity as to provide a comprehensive picture of present-day practices and trends in the power field. The total capacity represented by these orders was more than

7,000,000 kilowatts

Reheat boilers accounted for over 90 per cent of this capacity. Since the use of reheat has become almost universal practice with respect to medium size and larger units, the following comments on trends are based on orders for *reheat boilers only*.

UNIT CAPACITIES— Bigger turbine-generators continue to be the order of the day. Average capacity is about 148,000 kw. Eight units are rated at 200,000 kw or higher, the two largest being 325,000 kw.

STEAM PRESSURES— Most notable trend is growing adoption of 2400-lb range. Twelve units, representing 31% of the capacity, are in this category. 1955 orders also included one supercritical pressure unit—3500 psi. Units from 2000 psi up represent nearly 60% of the capacity.

STEAM TEMPERATURES— Almost 45% of the units will have primary steam temperature of 1050 F and one unit will be designed for 1100 F. These units account for 55% of the capacity.

CONTROLLED CIRCULATION— Continuing its dominant position in the high pressure field, C-E Controlled Circulation designs accounted for 73% of all C-E reheat capacity ordered last year and 100% of the capacity for pressures from 2000 psi up.

FIRING— 87% of the capacity will be fired by C-E Tilting Tangential Burners. Coal stays well out in front as the No. 1 utility fuel, being specified as the primary or exclusive fuel for nearly 75% of the units. However, virtually all these units, whether the primary fuel be coal, oil or gas, will be designed for easy convertibility to the use of other fuels.

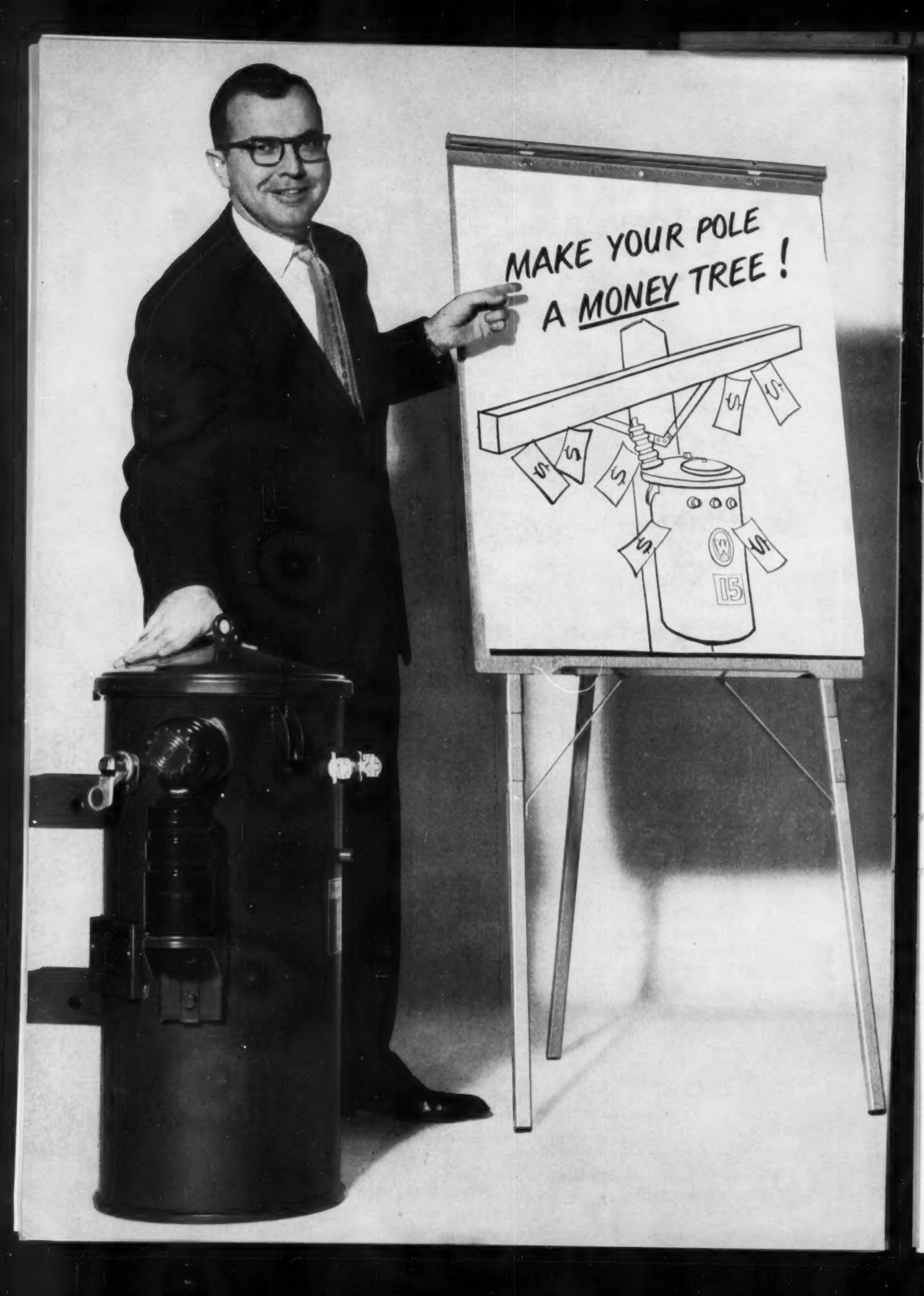
DUAL FURNACES— Completely separated furnaces will be used for 20% of the units, including all units from 200,000 kw up. (Nine C-E dual furnace units are now in service and six more, ordered prior to 1955, are in process.)

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; HOME HEATING AND COOLING UNITS; DOMESTIC WATER HEATERS; SOIL PIPE

8-900


MAKE YOUR POLE
A MONEY TREE !
15

Increase transformer overload capacity 20%

. . . without sacrifice of service life

Bold pioneering with a new system of Life-Testing now reveals how much heat modern Westinghouse transformers can take—and still deliver continuous service. Applied to the 1956 line of Westinghouse distribution transformers, it means simply this —greater, longer overloads, *without sacrifice of normal service life.* In addition, it offers a welcome reduction in costly emergency service calls.

NEW "CSP®" TRANSFORMERS—Higher breaker settings boost overload capacity an average of 20%. Drastically reduced breaker trip-outs, greater flexibility in timing of change-outs . . . all this is available in the new Westinghouse "CSP" transformers because breaker settings have been stepped up to take advantage of the extended safe range. These new settings are based on 18 months of laboratory life-testing, backed up by as much as three years of field experience by three utilities.

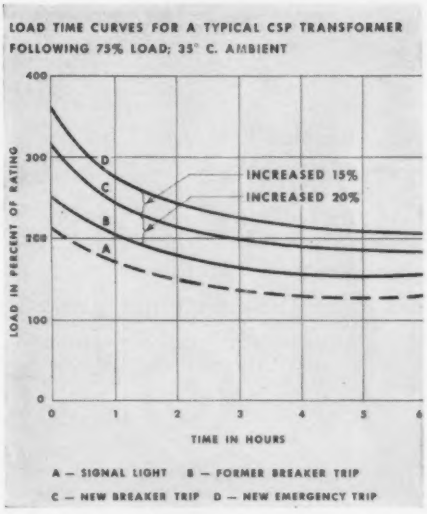
NEW CONVENTIONAL TRANSFORMERS—Available with new TD indicator to take guesswork out of loading. All the advantages proved by Functional Life-Testing are offered in conventional transformers, and in addition:

Now, for the first time, they can be loaded for peak efficiency. Because the new TD indicator keeps an accurate and permanent record of overload hours, the two extremes of burnouts in some locations with wasted capacity in others can easily be avoided. This is an effective tool for load management.

The combined effect of newly proved thermal endurance and the efficiency of loading substantially increases conventional transformer economy.

For further information on the all-new lines of distribution transformers, call your nearest Westinghouse representative, or write direct to Westinghouse Electric Corporation, P. O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-70761

◀ Bob Wagner, Manager, Distribution Equipment Sales, dramatically points out that there's more money on the line for utilities using the new Westinghouse distribution transformers.



Higher breaker settings on the new "CSP" transformer give 20% more sustained overload capacity without sacrifice in transformer life, additional 15% emergency range. Signal light remains at standard ASA setting.

A cumulative overload record. Signal light shows when unit is overloaded on the basis of copper temperature; dial records total hours of overload experienced. Easily read from the ground. Can be reset.

YOU CAN BE SURE...IF IT'S

Westinghouse

The Big News for '56

Now...a KUHLMAN transformer factory

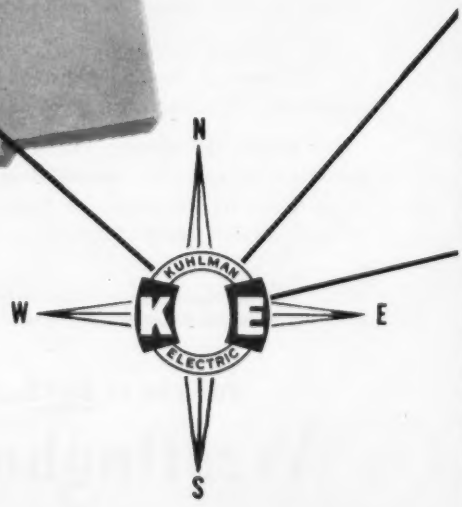
Each Factory Can Better Solve Your Transformer Problems With Efficient Regional Production Scheduling, Warehousing and Servicing.

You'll get faster transformer deliveries—improved regional manufacturing and warehousing—more personal factory-to-customer service from the newly expanded KUHLMAN factory in your area.

This expansion of regional service and manufacturing is the result of a growing preference for KUHLMAN quality by many of the country's leading utilities. In fact, customer acceptance has approximately doubled KUHLMAN'S factory floor space in the last four years. Today, three independent producing factories—like the one in your area and 31 finished product distribution centers with 51 sales offices stand ready to serve you nationally—and by regions.

Ask your local KUHLMAN representative exactly how he can put KUHLMAN'S new regional manufacturing and distribution facilities to work for you. He'll be happy to explain, and with all of us, extend to you a most cordial invitation to visit your regional KUHLMAN plant for a friendly plant tour.

SALINAS, CALIFORNIA . . . serving the eleven Western states is one of the nation's most modern transformer factories, producing a full line of distribution transformers.



in your area

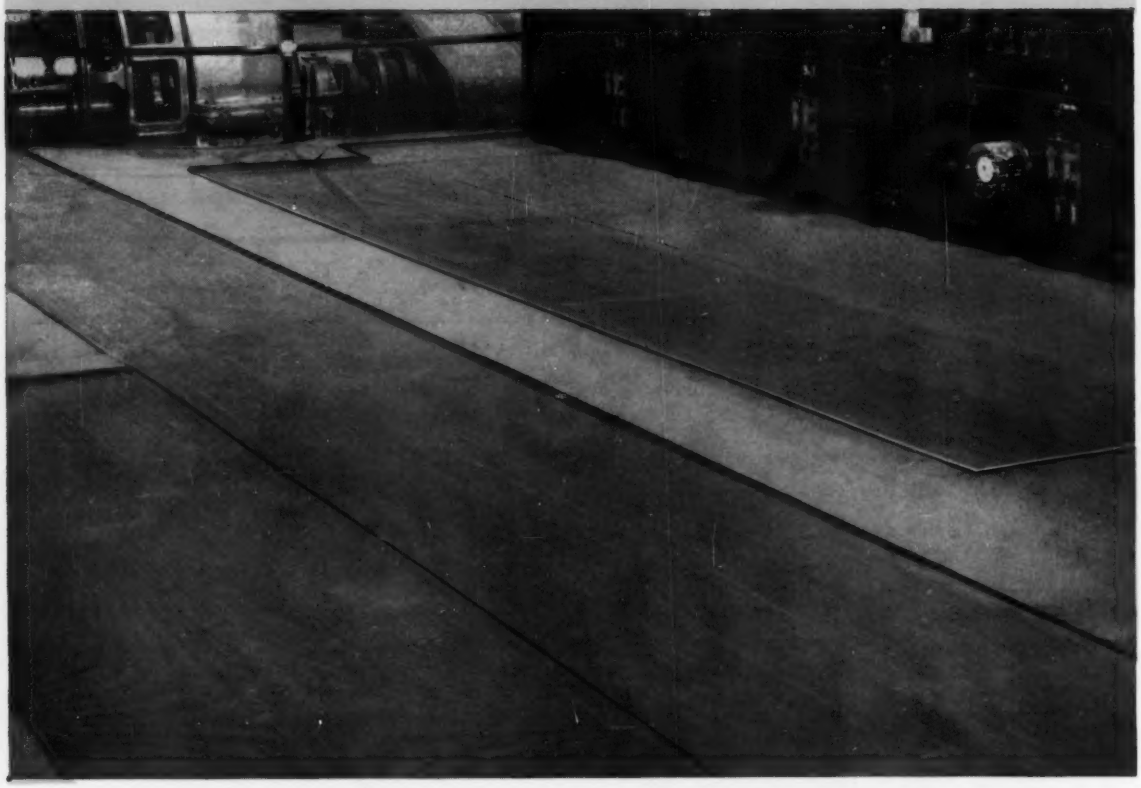
BAY CITY, MICHIGAN . . . located in the heart of the industrialized Middle West and Northeastern United States, this KUHLMAN factory has a 62 year old record of service to industry.

CRYSTAL SPRINGS, MISSISSIPPI . . . both serving and contributing to the development of diversified Southern industry, this KUHLMAN factory produces a complete line of power and distribution transformers.

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

Insulate electrical apparatus with U. S. Switchboard Matting



Service at indicated voltage guaranteed!

Factories, mines, utilities, and railroads who must insulate electrical equipment against dangerous voltages find U. S. Switchboard Matting does a full protective insulation job. It has been tested over ***entire areas*** with stated potential to *guarantee service at indicated voltage*.

Style E-9838

U. S. E-9838 Switchboard Matting has been electrically tested in accordance with A.S.T.M. Spec. (D178-24), spot-tested for 40,000 volts dielectrical strength or better, proof-tested at 15,000 volts over the entire area and recommended for use up to 3,000 working voltage.

In addition, U. S. E-9838 Switchboard Matting is stenciled on the back – every three (3) feet as follows: "Electrically tested in accordance with A.S.T.M. (D178-24)"

Style E-2306

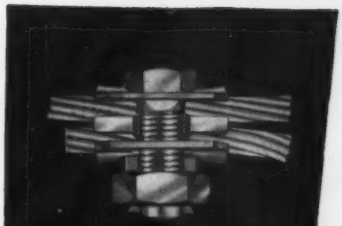
U. S. E-2306 Switchboard Matting has been electrically spot-tested for 20,000 volts and dielectrically proof-tested at 7,500 volts and recommended for use up to 1,500 working voltage. In addition, this grade is stenciled on the back – every three (3) feet as follows: "Electrically tested and recommended for 1,500 working voltage."

Obtainable from any of United States Rubber Company's selected distributors or any of the 27 "U. S." District Sales Offices, or write to us at Rockefeller Center, New York 20, N. Y.

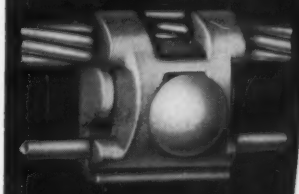
US RUBBER

Mechanical Goods Division

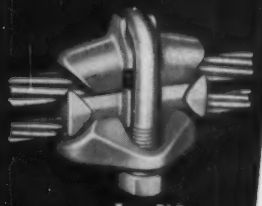
United States Rubber



Type AAW

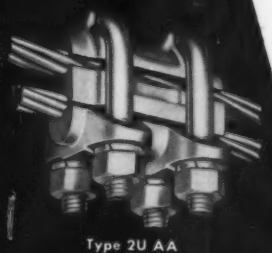


Type PAA

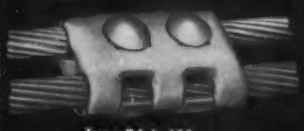


Type DLC

Type W



Type 2U AA



Type PAA 400

There's a BLACKBURN clamp for every ALUMINUM CONNECTION

Always Use Blackburn Aluminum Fittings When Terminating or Joining Aluminum Conductors

- Each clamp accommodates a wide range of conductors.
- Castings are high-strength, corrosive-resistant, heat treated aluminum alloy.
- Blackburn special surface treatment eliminates production oxides and improves conductivity.
- Bell contoured grooves protect conductors. Clamping forces are distributed over extra-large contact area.
- Available with galvanized steel or aluminum hardware. Aluminum hardware is alumilited to prevent seizing.
- Can be quickly and easily installed with regular linemen's equipment. No special tools required.

IMPORTANT: We recommend the use of CONTAX on all aluminum connections. CONTAX is an oxide inhibiting compound with an ASTM drop point of 549° F.

BLACKBURN *Aluminum* **FITTINGS**

JASPER BLACKBURN CORPORATION
35 Madison St., St. Louis 6, Mo.
Phone MAin 1-2821

NEW NICOPRESS NO. 88 TOOL with

INTERCHANGEABLE HEADS ARE QUICKLY ATTACHED

INTERCHANGEABLE HEADS

● This mechanical tool develops tremendous power by a combination of compound leverage and progressive ratcheting action. A few short strokes of the easy-working handle produce the powerful jaw pressure necessary to assure dependable full-tension splices.

Quickly-changed tool heads permit splicing a wide range of larger conductors. Write for Bulletin 88.

NICOPRESS . . . the tool and the sleeve that are made to work together . . . *together* they make the perfect splice.

Nicopress Sleeves and Tools Patented in U.S. and Foreign Countries. "Nicopress" Registered in U.S. and foreign countries.

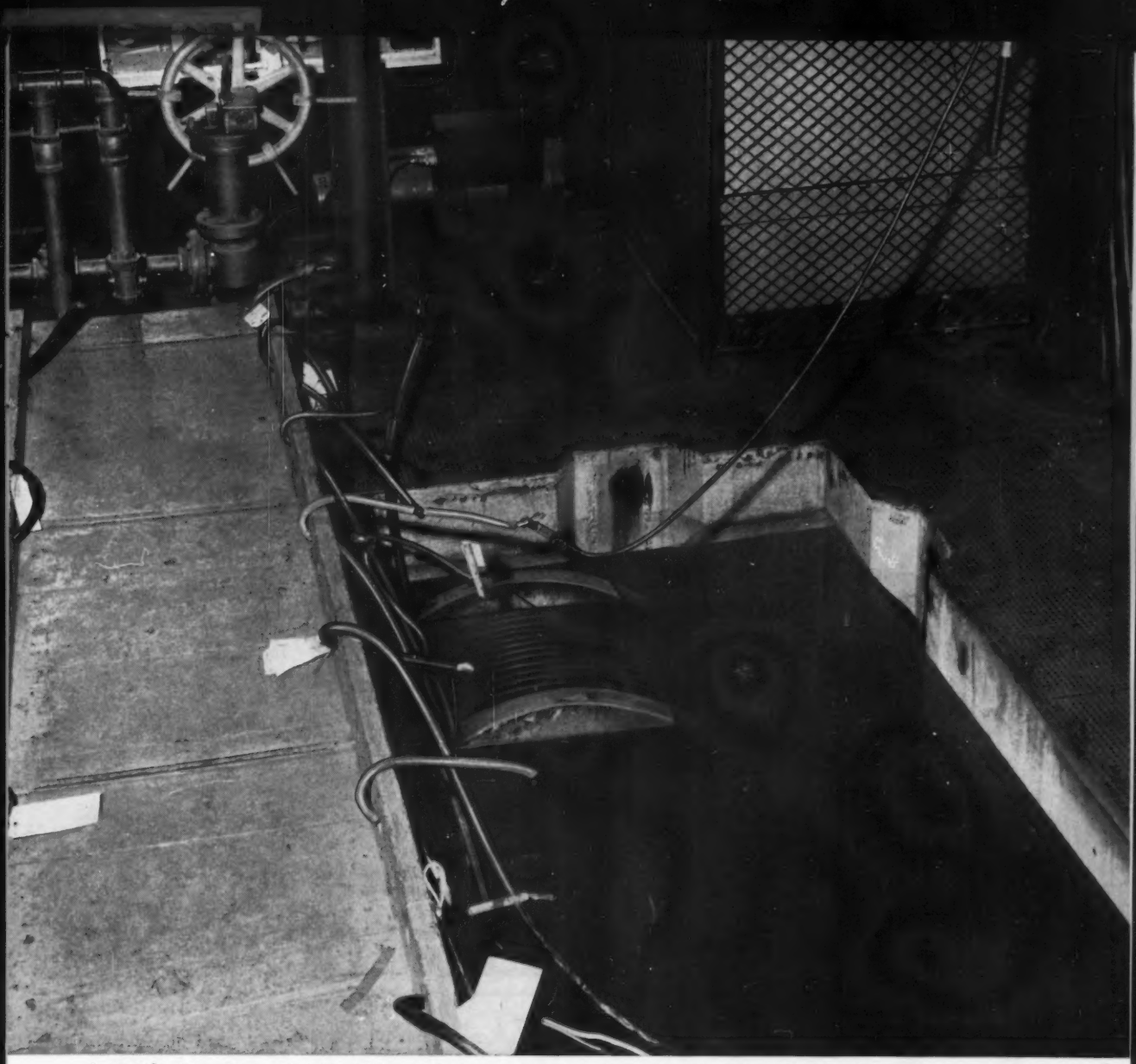
The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY



Anaconda 15-kv cable is subjected to 106 kv — 33% above industry standards with d-c. And tested at 25% above industry requirements with a-c.

15-KV CABLE GOES

Skin diving at 106 kv

Anaconda Type AB butyl-insulated high-voltage cable is tested under water at 600% overvoltage to assure you peak performance.

The fact that two high-voltage cables may look alike does not mean they'll perform alike. At Anaconda, 15-kv cable is tested at 106 kv with d-c for fifteen minutes. This voltage is 33% *above industry standards with d-c.* And in addition, Type AB is tested at 25% *above industry requirements with a-c.*

Only a vastly superior insulation can stand such high test voltage, even though there is no defect in the cable.

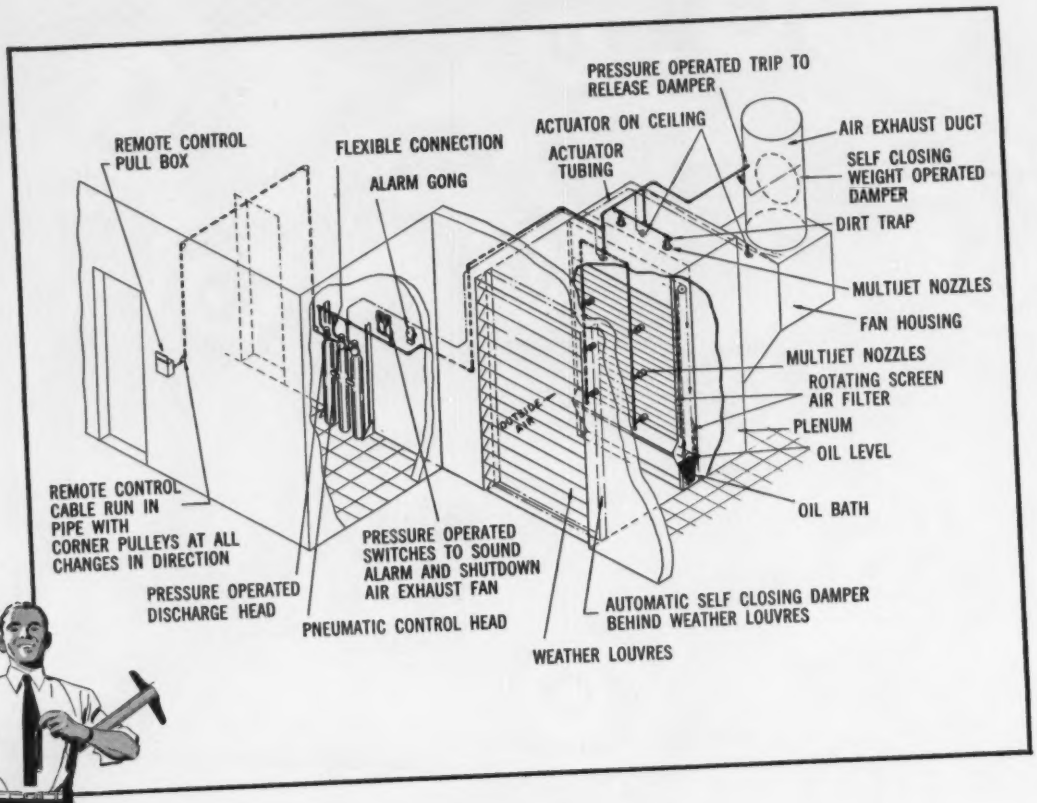
For your assurance of maximum service, Anaconda butyl-insulated cables are designed to perform far beyond industry requirements — in every important electrical and physical property.

New Engineering Bulletin EB-27 gives you full details on performance of Type AB insulation in 15 Industry Specification tests. Ask the Man from Anaconda for your copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 86294

Get all the facts on Anaconda Butyl. Write today —

SEE THE MAN FROM ANACONDA®

pioneer in **BUTYL INSULATION**



GUARD OIL BATH AIR FILTERS WITH KIDDE ENGINEERED FIRE PROTECTION!

LOOK HERE—a fire hazard that could easily turn a building to a heap of cinders—*completely* protected by a tailor-made Kidde CO_2 Fire Extinguishing System! Kidde engineers haven't missed a trick!

At the first sign of fire, rate-of-temperature-rise detectors trigger the system, pressure-operated switches simultaneously close dampers, shut down fans and sound an alarm while fire-killing clouds of CO_2 stop the blaze in its tracks. What protection!

And what features Kidde systems have! Using safe, efficient CO_2, they leave no mess to damage equipment, nothing to clean up after a fire. And their special rate-of-temperature-rise detectors insure *complete* protection 24 hours a day. Kidde systems need no attendance, day *or* night!

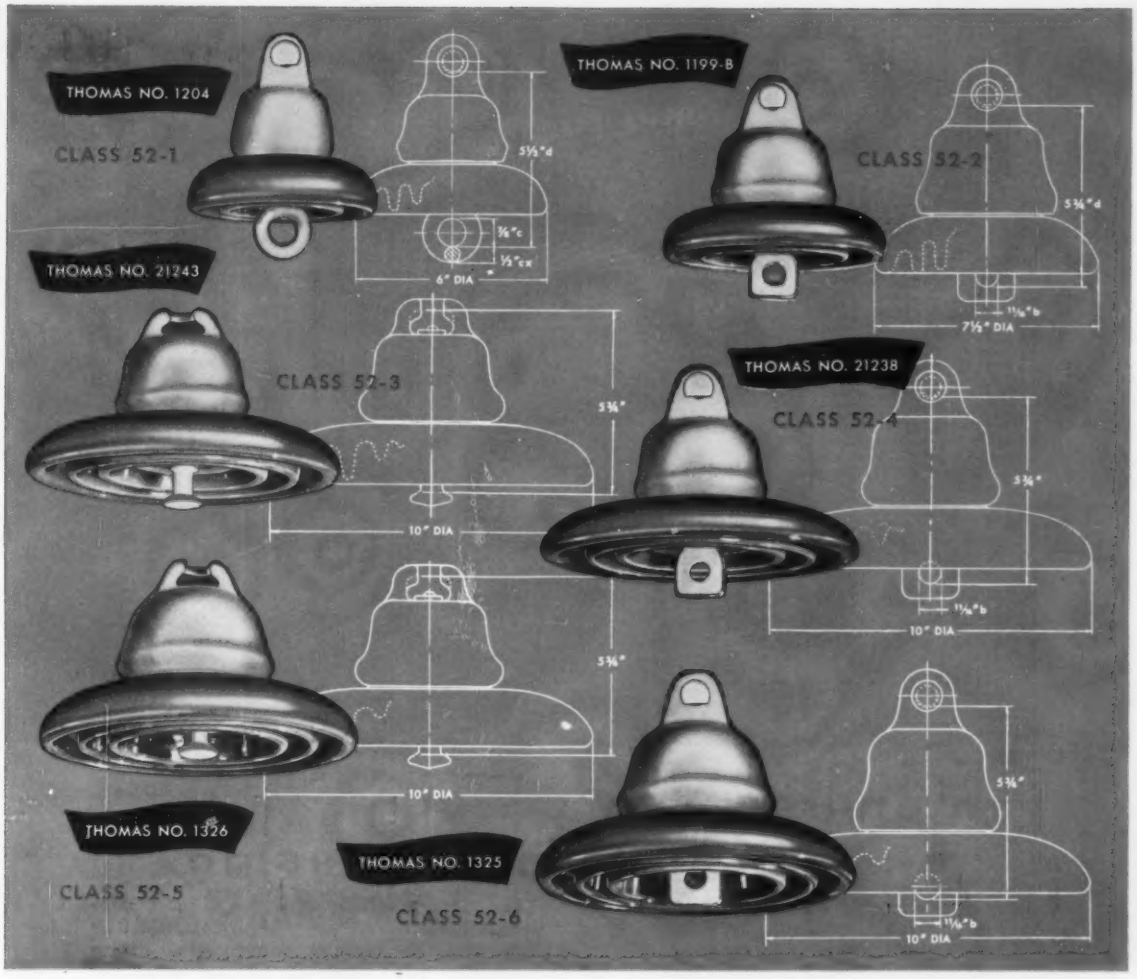
Kidde systems have no falling weights, use no clumsy mechanical triggering methods. Pneumatic or Electrical Control Heads insure instant and complete CO_2 discharge. All moving parts of a Kidde system are self-enclosed for safety, need no replacement after a fire, have easy-to-read indicators which show at a glance whether system is "set" or "released." What's more, special Directional Valves let you guard more than one hazard from the same cylinder bank, giving you the most *versatile* protection on the market today!

It's easy to get the *best* in fire protection. For information about *your* specific problems, write Kidde today.

Kidde

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc.
330 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto



THOMAS EEI-NEMA STANDARDS

Two of the strongest arguments for standardization are stock simplification and the advantages of interchangeability. Although we catalog many different designs, we are 100% in support of any standardization that we believe helps the industry. Therefore, we suggest users specify EEI-NEMA Standards for their suspension insulator requirements.

Thomas insulators are backed by 83 years of ceramic experience and knowledge. Quality material, precision manufacturing and PROOF OF PERFORMANCE make Thomas porcelain the standard of comparison for discriminating engineers throughout the Electrical Industry.

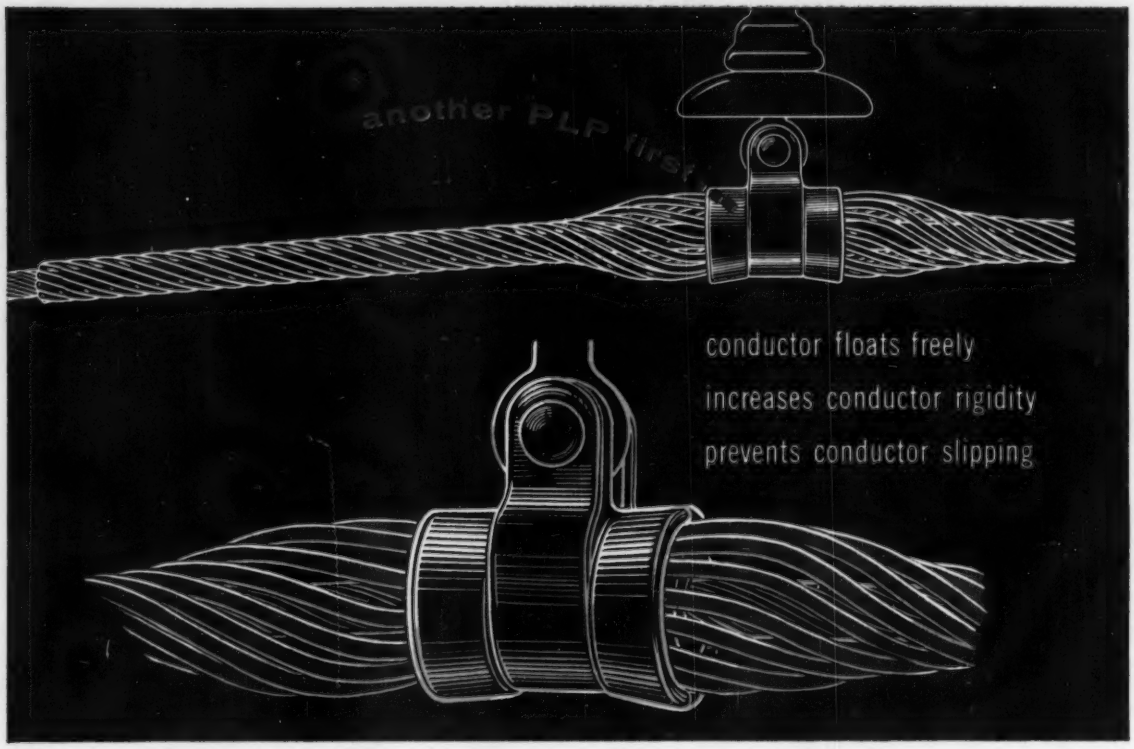
In 1907, Thomas designed and made the first cap-and-pin suspension insulator. Units installed that year are still giving trouble-proof service after 49 years of continuous operation.

Specify Thomas EEI-NEMA Suspension Insulators with full confidence that their quality and value cannot be surpassed.

The R. Thomas and Sons Co.

LISBON, OHIO

1873 THOMAS INSULATORS our 83rd year RELIABILITY 1956



an entirely new concept in suspension design

After five years of intensive laboratory research and field experience, Preformed Line Products Company announces the ARMOR-GRIP SUSPENSION. This is not just a modification of the conventional clamp—in fact, in a sense it is not a "clamp" at all. The ARMOR-GRIP SUSPENSION is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Armor Rods which distribute their pressure over a relatively large area. An ingenious relation between rods and housing prevents the suspension assembly from slipping longitudinally. The expanded configuration of the PLP rods also adds rigidity to the conductor while slight vertical resilience of the conductor mounting eliminates a steep stress gradient.

THE ARMOR-GRIP SUSPENSION ELIMINATES CONCENTRATED CLAMPING STRESSES.

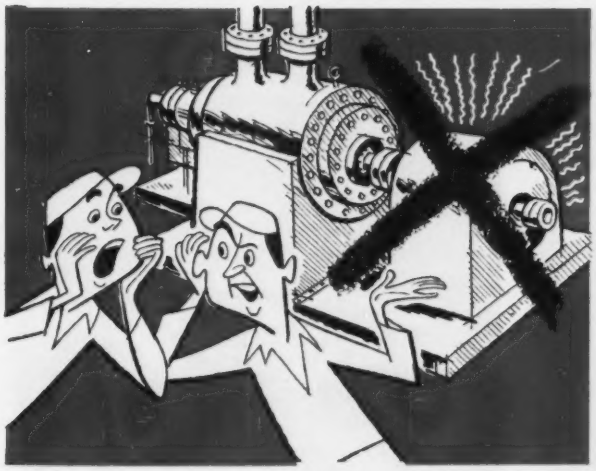
In severe accelerated vibration tests, conductor mounted in the PLP ARMOR-GRIP SUSPENSION outlasts conventional clamp assemblies many times—in fact, no conductor failures have ever occurred under the ARMOR-GRIP SUSPENSIONS in these tests. Thousands of ARMOR-GRIP SUSPENSIONS have been installed during the past four years—with NO reported case of unsatisfactory performance.

Yet with all these functional advantages, the ARMOR-GRIP SUSPENSION is very easy to install. Simplicity of design has eliminated many parts—there are less than one-half the number contained in a conventional clamp assembly. Only one nut to tighten.

The ARMOR-GRIP is immediately available in conductor sizes in the ranges of 336,400 cm, 477,000 cm, 795,000 cm, 954,000 cm ACSR and All-Aluminum. Other sizes will soon be available and can be produced on request.

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PREFORMED LINE PRODUCTS COMPANY
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO
TELEPHONE: CLEVELAND EXPRESS 1-3571



Eliminate This Sound "Barrier"

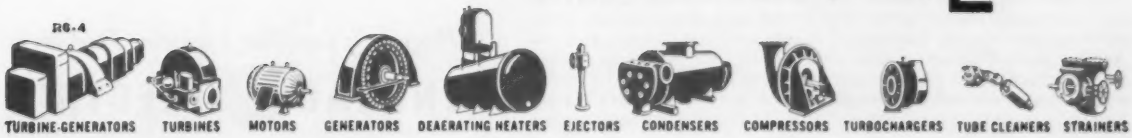
the NEW ELLIOTT *Quiet* 2-POLE MOTOR

• Objectionable, distracting noise usually associated with large 2-pole motors, has been a "barrier" to operator comfort and efficiency and a hindrance to sound plant community relations. The new Elliott *Quiet* 2-pole motor reduces offensive noise with a design that minimizes and muffles the disturbing high pitch sound right at its source. The answer is found in many elements of this new motor — rotor, stator and even a special ventilating system that helps baffle and absorb the sound. Arrange now to "hear" this new Elliott motor. Check with your Elliott Representative or write Elliott Company, Ridgway Division, Ridgway, Pa.

Elliott FABRI-STEEL MOTORS AND GENERATORS

ELLIOTT Company

RG-4



TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS

MICROWAVE COMMUNICATIONS:

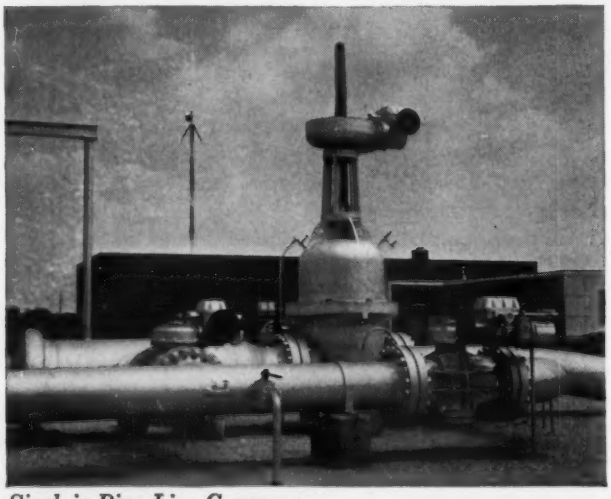
Public Service Company of Indiana, Inc.

Microwave radio aids in controlling supply of electricity for the state of Indiana. Four branches of a G-E Microwave system—combining voice and telemetering channels—originate at utility headquarters in Plainfield. From this hub regional demands are controlled according to local needs. Load control information obtained by remote control telemetering is analyzed, then transmitted to generating stations in necessary areas. Entire electrical power system is linked solidly by microwave radio.

Busy Tower

Antenna receives, transmits, or relays voice or telemetering signals. Antennas like these link headquarters with generating plants and sub-stations over a wide area.

P.S.I.'s microwave network provides utmost dependability because of standby equipment, fail safe feature, and because equipment can be concentrated at specific locations where it can be fully protected and easily maintained.



Sinclair Pipe Line Company

Microwave radio helps Sinclair coordinate flow of crude oil and oil products over many states—even turns pumps on and off. 7 voice, 4 telemetering channels link Cushing, Oklahoma and East Chicago, Indiana. Another channel permits remote control of 16 VHF radio base stations along the line which provide communication between over 100 radio-equipped vehicles and any company office in the microwave system. System is capable of providing up to 12 additional channels as needed.

Are microwave circuits your answer, too?

It depends.

What kind of service do you provide, how do you do it?

Let's assume that instant control and coordination of many functions, over long distances, are vital to your needs. Then you *should* investigate microwave because it is dependable, economical, and inexpensive to add additional circuits.

The services shown here *need* dependable voice and signal circuits. One controls the flow of crude oil and oil products over many states. The other uses microwave to link electric power facilities throughout one state.

Both use G-E Microwave Equipment for efficiency and economy. For additional microwave information, write: *General Electric Co., Microwave Equipment, Sect. X1936-5, Electronics Park, Syracuse, N.Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Buried 15 Kv high-voltage cable

gets lasting protection with Du Pont ALATHON®

ALATHON® 4 for jacketing offers high impact strength, exceptional outdoor durability and superior resistance to stress cracking.
Shielding tape
ALATHON® 5 for primary insulation is unpigmented, has a low power factor and dielectric constant which remain essentially unchanged over the entire range of frequencies.
DANGER
HIGH VOLTAGE
KEEP AWAY
DANGER
CABLE BURIED HERE

Cable supplied by Anaconda Wire & Cable Co., New York, N. Y.

A cable operating at 15 Kv underground must be constructed with insulation and jacketing which assure lasting, trouble-free protection. The insulation must have exceptional dielectric strength and the jacketing must have outstanding resistance to mechanical damage, chemical action and moisture. When a large eastern chemical company needed such a power cable for their new testing laboratory, they specified insulation and jacketing of "Alathon."

Du Pont "Alathon" polyethylene resin features low power loss and low dielectric constant, toughness and flexibility, even at extremely low temperatures, and outstanding moisture resistance. With insulation or jacketing of "Alathon," you get cable that is light in weight, flexible and easy to handle. Installation is speeded by its ease of pulling, cleanness in handling, and simplified jointing and terminating requirements.

To get complete property and application data on "Alathon," clip and mail the coupon below.

There is a difference in polyethylenes —

specify **ALATHON®**
polyethylene resin

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department,
Room 353, Du Pont Building, Wilmington 98, Delaware
In Canada: Du Pont Company of Canada Limited,
P. O. Box 660, Montreal, Quebec.

Please send me complete information on Du Pont "Alathon" polyethylene resins. I am interested in evaluating these materials for

_____

Name_____

Position_____

Firm Name_____

Street Address_____

City_____ State_____

Type of Business_____

range-taking

TRANSFORMER GROUNDING CONNECTOR type EQC

fits all standard EEI-NEMA distribution transformers . . . no stress corrosion cracking

here are features your line crew will appreciate:

- easy one-wrench installation
- wide range . . . from 8 sol. to #2 str. copper
- rotation of connection eye allows vertical or horizontal installation

For other grounding problems . . . write for Burndy Grounding Catalog G 47

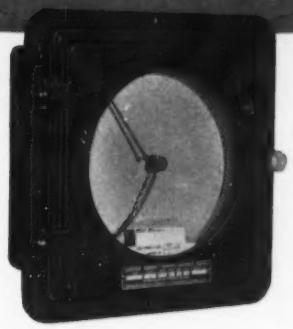
IN STOCK — FOR IMMEDIATE DELIVERY

BURNDY

55-23

Norwalk, Connect. • Toronto, Canada • Other Factories: New York, Calif., Toronto • Export: Philips Export Corp.

These Lincoln Semiflush Switchboard Graphics measure substation total load, both KW and KVA. Note individual circuit measurement with Lincoln Triplex Ampere Demand Meters at top of switchboard.

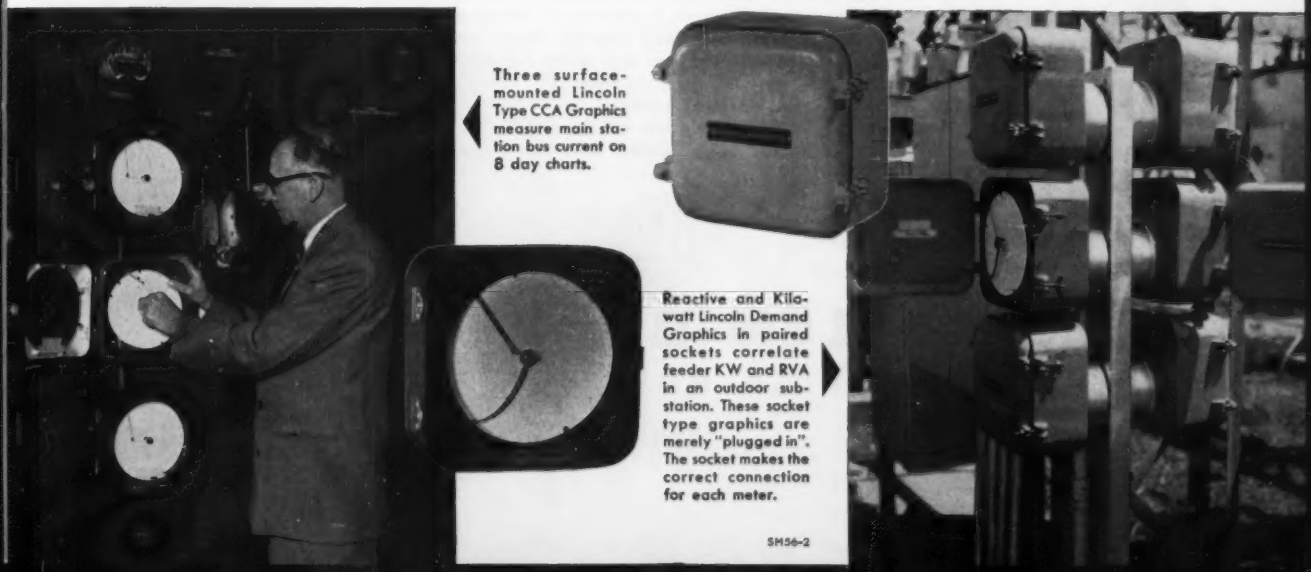


Put Substation Operating Data on Record with LINCOLN GRAPHIC METERS

When knowledge of time and duration of loading conditions is required for system betterment—Lincoln Graphic Meters offer a simplified low-cost means of system measurement. Lincoln Graphics are thermally lagged to integrate minor fluctuations into a clearly defined line, making legible records possible on single charts up to 32 days.

Write today for full information on Lincoln Graphic Meters and Simplified Measurement for System Operation.

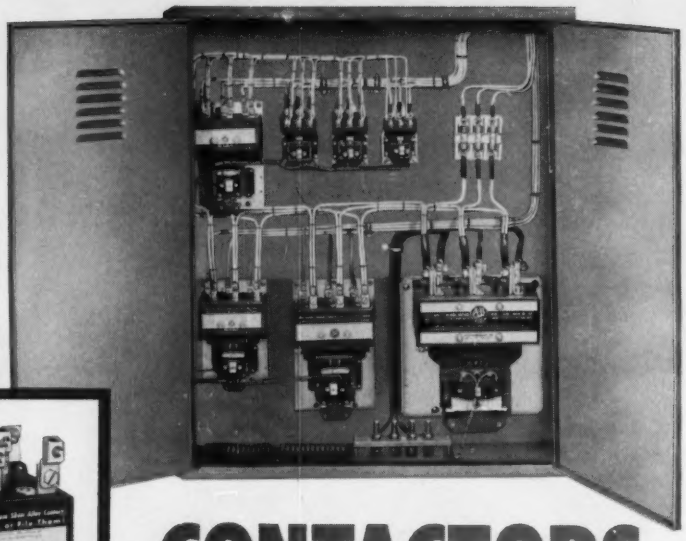
SANGAMO ELECTRIC COMPANY • Springfield, Illinois



Three surface-mounted Lincoln Type CCA Graphics measure main station bus current on 8 day charts.

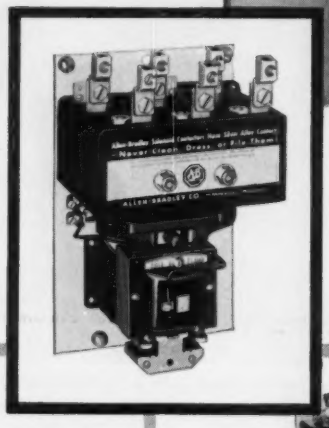
Reactive and Kilowatt Lincoln Demand Graphics in paired sockets correlate feeder KW and RVA in an outdoor substation. These socket type graphics are merely "plugged in". The socket makes the correct connection for each meter.

SM56-2



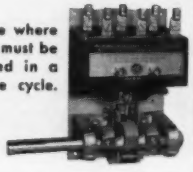
Sorensen load-simulating panel for testing electric generators. Equipped with seven Allen-Bradley Bulletin 702 solenoid contactors —Sizes 1 to 4, inclusive.

Below—Bulletin 702 Size 3 solenoid a-c contactor.



CONTACTORS

IN NINE SIZES • UP TO 900 AMPERES

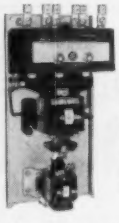


For use where circuit must be switched in a definite cycle.

Bulletin 703 cam-operated three-pole a-c contactor.

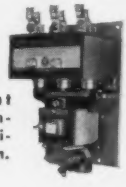
Size 2 two-pole solenoid contactor for 3-wire control.

Bulletin 702 solenoid operated alternating current contactor.



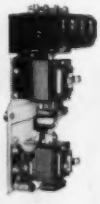
Size 2 hum-free, mechanically held contactor. No coil current flows when the contactor is closed.

Bulletin 704 Style ML contactor with a magnetic latch.



Permanent magnet contactor. Eliminates a-c hum.

Bulletin 704 Style PM permanent magnet a-c contactor.



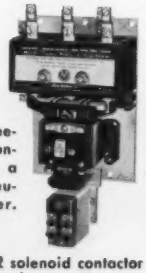
Size 1 three-pole contactor with mechanical holding latch — hum-free operation.

Bulletin 704 Style ML magnetic latch a-c contactor.

Allen-Bradley Bulletin 702-704 solenoid contactors can be closely grouped on metal panels.

The solenoid construction means ONLY ONE MOVING PART. No pins, pivots, or bearings to corrode and stick . . . just the ONE-PIECE solenoid plunger which carries the double break, silver alloy contacts. You never need to file, clean, or dress the contacts . . . they are always in good operating condition.

Bulletin 702-704 contactors are listed in 9 sizes in the Allen-Bradley Handy Catalog. Send for your copy.



Size 2 three-pole a-c contactor with a Bul. 849 pneumatic timer.

Bulletin 702 solenoid contactor with timer—1/10 sec. to 3 min.

Allen-Bradley Co.
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SOLENOID MOTOR CONTROL

QUALITY

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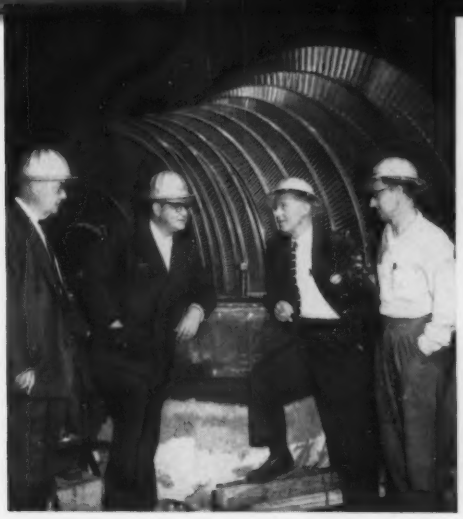
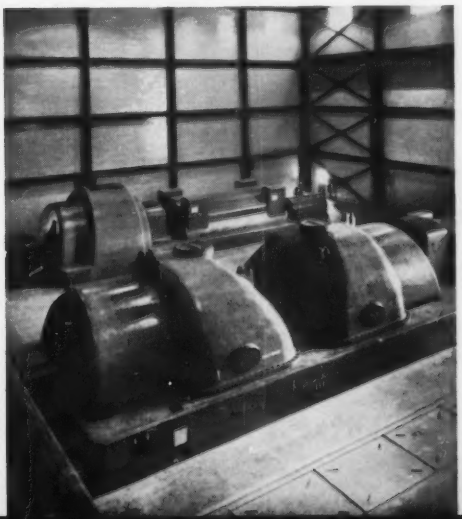


Robert Higgins, Howard Barr, John Dunnewind and H. I. "Hi" Lamphier (left to right) discuss lubrication of equipment at Clifty Creek plant. Howard Barr and Hi Lamphier are plant manager and assistant plant manager respectively. Standard Oil men Bob Higgins, industrial lubrication specialist and John Dunnewind, chief lubrication engineer provide lubrication technical service to customers. Together they have more than 38 years experience in such work—Bob 18 years, John 20. John has an engineering degree from the University of Michigan and is a graduate of Standard's Sales Engineering School. Customers of Bob Higgins and John Dunnewind find this kind of experience and training pay off *for them.*

Clifty Creek management selects NONPAREIL Turbine Oil—

—receives life-of-turbine guarantee for the oil

Approximately 60,000 gallons of NONPAREIL Turbine Oil were purchased for Clifty Creek, most of which are to be used to fill lubrication systems. Kilowatt capacity of installation will slightly exceed that of Hoover Dam.



Power and lots of it has been ordered for the AEC gaseous diffusion plant near Portsmouth, Ohio. Clifty Creek Plant in Indiana is the larger of two plants being built by Ohio Valley Electric Corporation to supply this demand. Six giant turbogenerators will be housed in the Clifty Creek plant. Combined capacity will be 1,290,000 kw.

NONPAREIL Turbine Oil will be the lubricant for Clifty Creek's six 215,000 kw. turbines. The oil is guaranteed, for the life of the turbines, not to exceed a neutralization number of 0.15 mg.KOH/gm.

Six other important benefits are obtained by the use of NONPAREIL Turbine Oil:

1. Correct viscosity to lubricate without excessive fluid friction.
2. Good demulsibility to permit removal of water which unavoidably gets into the oil.
3. High oil stability to insure resistance to oxidation and sludging.
4. Low pour point for fluidity at any operating temperature normally met.
5. Resistance to foaming, with special additive to counteract foaming tendency.
6. Capacity for protecting metal parts against corrosion.

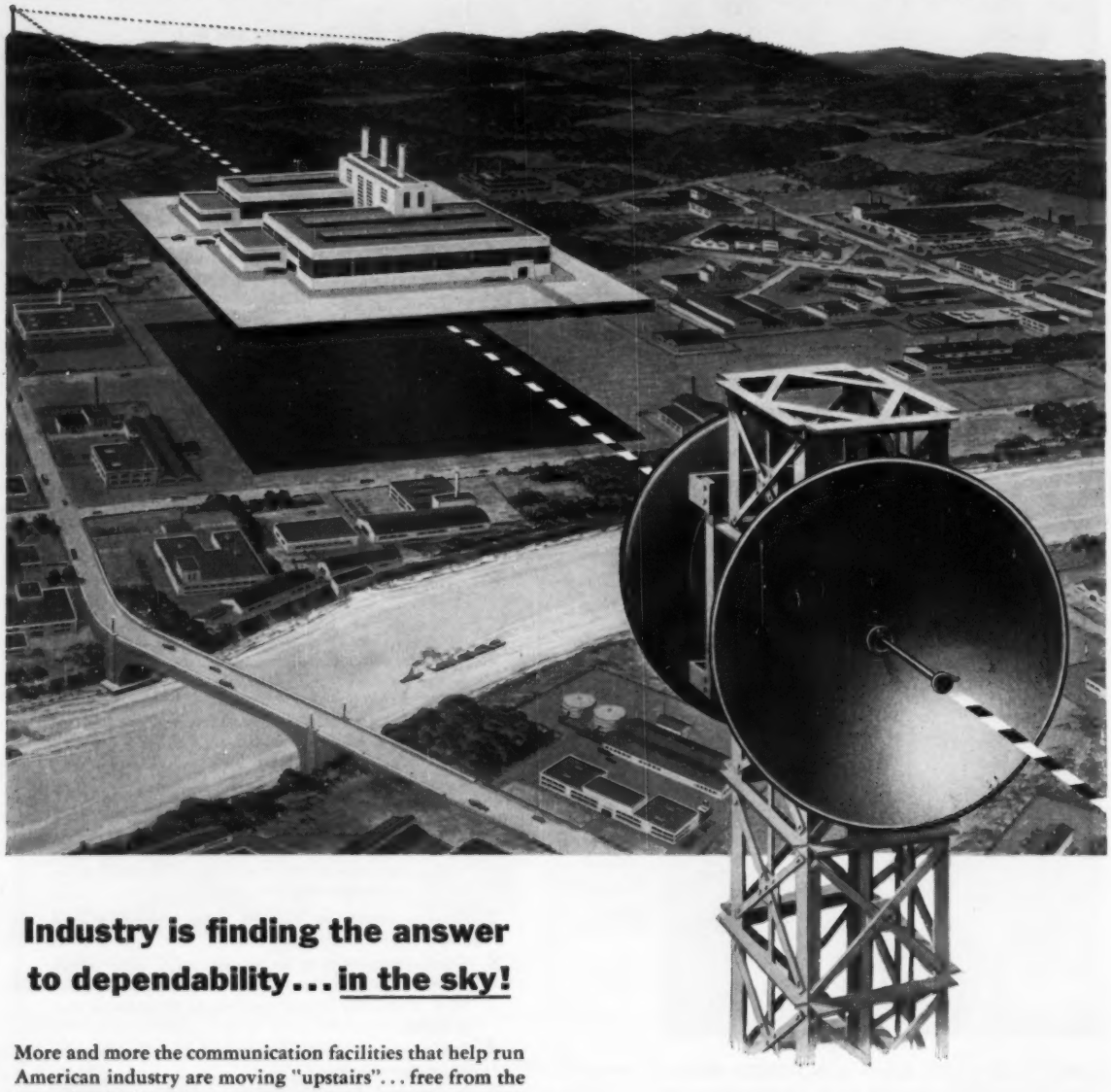
Clifty Creek turbines join more than 800 other turbines now using NONPAREIL Turbine Oil, some for as long as 29 years. Inquire about NONPAREIL Turbine Oil of your Standard Oil industrial lubrication specialist in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

NONPAREIL Turbine Oil guarantee that will hang beside each of the six turbines at Clifty Creek.

STANDARD OIL COMPANY
(Indiana)

STANDARD

FEDERAL MICROWAVE—"*CERTIFIED BY A WORLD OF RESEARCH*"



Industry is finding the answer to dependability... in the sky!

More and more the communication facilities that help run American industry are moving "upstairs"... free from the hazards of blizzards, hurricanes, floods, and fires... the high cost of repair and replacement... the loss that goes with every crippling storm.

The virtually indestructible chains of miles-apart towers that provide industry with microwave circuit pathways in the sky are matched by the *quality* of their service ... the versatility, flexibility, and dependability of multiplex and RF elements in a well engineered microwave system.

Federal Microwave equipment ranks at the top on all these points. It is microwave at its simplest and best... incorporating the techniques and design features developed in many countries by microwave specialists of International Telephone and Telegraph Corporation... *first* to bring commercial microwave to the world!

The records of high reliability achieved by *Federal* Microwave in all-purpose industrial communication is proof that today's soundest microwave investment is the system that's *"Certified by a World of Research!"*

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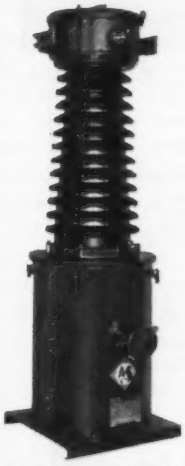
All pertinent mechanical and electrical information is in convenient data sheets. It is yours for the asking. Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

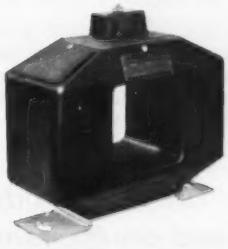
Outdoor current transformer, type KO, rated up to 15 kv, 800 amp.

Molded current transformer, type BKM for 1200 and 1500 ampere indoor or outdoor use, 600 volts.

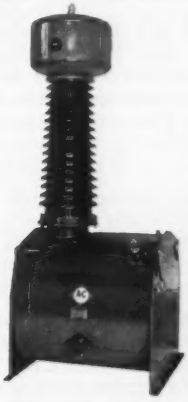
Molded current transformers, type TWM for 200, 400, 600 and 800 ampere, indoor or outdoor use, 600 volts.



Oil-insulated outdoor current transformer, type SCW for 25 kv to 138 kv.



Molded current transformers, type BKM for 2000, 3000 and 4000 ampere application, 600 volts.

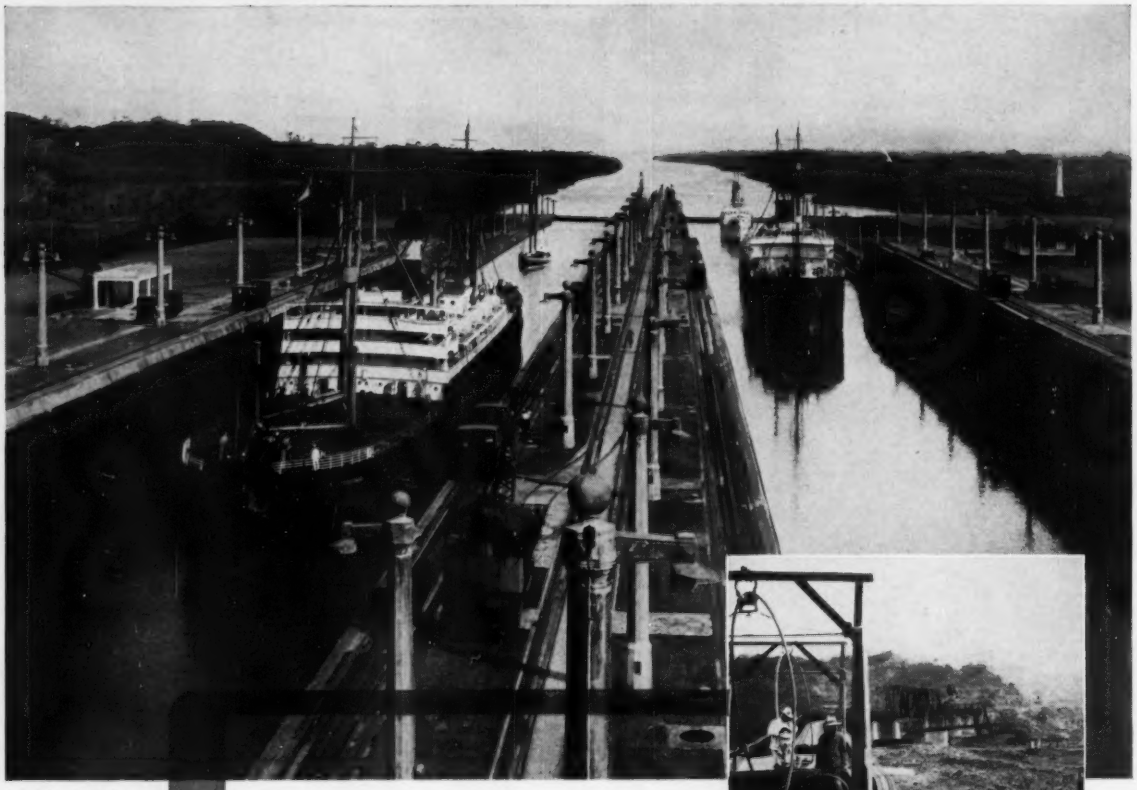


Oil-insulated outdoor potential transformer, type SPW for 25 kv to 138 kv.

Indoor potential transformer, type PD, rated up to 14,400 volts, fused or unfused.

A-4958

ALLIS-CHALMERS



The Panama Canal

Laying Kerite Cable across the Isthmus, 1908

Since it was first manufactured almost a century ago, Kerite insulated cable has been closely integrated with the international development of the communications industry. One of the most important installations of Kerite cable was made in 1908 across the Isthmus of Panama, a distance of 50 miles, uniting the Atlantic and Pacific ocean cables.

Early performance records of this outstanding product indicated that Kerite cable was unusually well equipped to withstand the extremely severe conditions attending this tropical installation. This cable, originally laid on the ground in the jungle, was submerged for 30 miles in Gatun Lake upon completion of the canal.

As a result of the operation of this initial cable, a second one was installed in underground ducts in 1918 under the supervision of Mr. C. R. R. Harris, now Chairman of the Board of The Kerite Company. Subject to similar adverse conditions, this cable continues to perform the important function for which it was designated at a critical point in communications history.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

EDITORIALS

For Easier Reading

Look below. Do you notice anything new about this page. You're right. The paragraphs following are set in larger type spaced for easier reading—a change we promised in our Jan. 2 issue. The type face remains the same. It has been used by Electrical World for nearly five years and is considered by experts to be one of the most readable of all present day types.

But the readability of any type diminishes as the number of characters in the line increases. So in accord with our policy of improving readability of the magazine we are moving up (11%) to a larger size for material set on wide measure.

Compare this new type size with that in the first paragraph and notice the improvement. You'll be seeing the new type on the editorial page, the Electrical Week pages, and in several departments. The change is a part of our continuing effort to bring you the best material in the easiest-to-read form.

Let the People Decide Niagara

After five years of political wangling, the development of the 1.1 million-kw power potential on the U. S. side of Niagara Falls is no nearer than when it was made available under the 1950 treaty with Canada. Meanwhile the Canadians have proceeded at a rapid pace toward harnessing the power on their side of the Falls.

Only progress that has been made toward U. S. development is that the federal government is no longer considered a serious contender for constructing and operating this proposed power project. Present leaders in the New York Legislature show little disposition to put that body on record as to whether the power should be developed by the five leading electric companies in the state or the Power Authority of the State of New York.

The federal legislature is again heading toward a deadlock on Niagara development. There is a 50-50 chance that the Senate may give a nod to the Power Authority development this year. But the House is certain to stick to its guns for electric company development which it endorsed by a 262 to 120 roll call vote in 1953.

This deadlock in Congress arises mainly from the fact that New York House members favor private development while the two Senators from the State appear to favor public development. Apparently all are trying to mirror the opinions of their constituents, but someone is obviously erring .

The only way we see to break this deadlock is to have the people in the state advise their political representatives of their opinions. This is possible under an advisory referendum which could be voted by the State Legislature. By enabling a vote on a referendum at the present session, legislative leaders would do much credit to themselves and perform a beneficial service for their state.

Those in favor of public power carry on their cause in the name of the people. Why not let the people say who shall develop Niagara power?

Shopping Center Problem

Electrical World editors came across a troublesome problem while collecting material for the special report on "Shopping Center Distribution" (EW, Feb. 20, p 103). It involved shifts to overhead services after the underground plans were completed and accepted by the original developer.

This situation occurred when original developers sold their holdings after the initial underground plan was drawn or when shops and buildings were added to a center by persons other than the original developer.

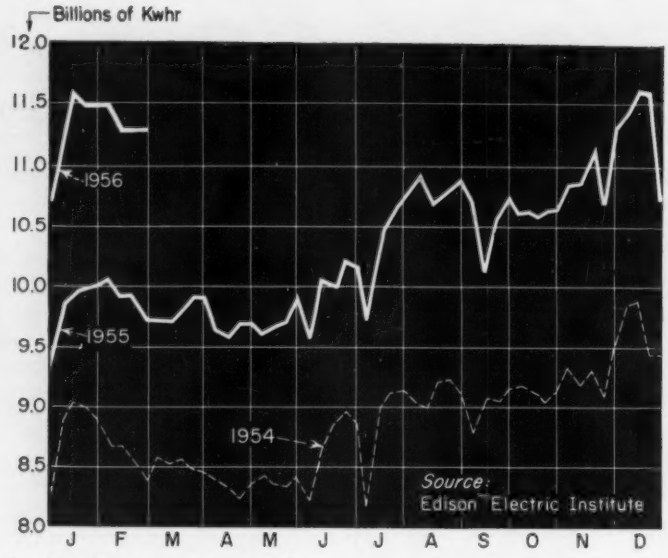
Utilities which have faced this problem have some suggestions for avoiding it in the future:

1. Utilities should make every effort to safeguard themselves and their customers in the initial planning.

2. Agreements made with an original developer covering underground service should be made binding on succeeding owners of the buildings.

3. Owners of buildings or shops added to a shopping center should be advised of the accepted plan for underground service and strongly urged to conform to the existing plan.

ELECTRICAL WEEK



OUTPUT

Week Ended Feb. 25
11,277,000,000 Kwhr
Up 16.0%

Atomic Energy Commission requirements — 1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 11.9%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Feb. 25	+16.0	+11.7	+10.2	+25.0	+7.6	+14.5	+13.7	+7.5	+21.1	+15.2
Feb. 18	+14.2	+10.0	+6.7	+22.8	+8.3	+11.2	+14.5	+8.7	+23.1	+14.6
Feb. 11	+14.3	+10.5	+8.3	+22.2	+8.4	+11.7	+14.1	+10.0	+21.5	+13.1

Seasonally Adjusted Index 216.8 Week Ago 215.4 Year Ago 186.6

Issue's Highlights—U. S. Supreme Court ruling in Pacific G&E-Sierra Pacific Power case upsets prevailing practices for increasing rates in long-term contracts. FPC's interpretation of Federal Power Act called in error . . . President, other government officials push stepped-up civilian atomic power program . . . Six manufacturers bid on atomic power plants American & Foreign Power plans for Latin America . . . Garrison Dam dedication marred by transformer failure . . . Aandahl, Kerr clash over SPA's proposed 40% wholesale rate increase . . . Consumers Power undertakes experimental installation of plastic poles.

Underground Service Rate—Southern California Edison has applied to California PUC for specific rates covering underground service. Proposed schedules would add a surcharge to standard overhead rates for new class of service in which company would furnish service from underground distribution system installed at its own expense but not required for its operating convenience. Edison has found that annual charge for underground facilities was six times annual costs for equivalent overhead facilities.

Santee-Cooper Report—Nine-man committee investigating financial affairs of South Carolina Public Service Authority (Santee-Cooper) has split on its findings with majority issuing favorable report. All agree on Santee-Cooper's solvency but disagree on causes of financial difficulty. But groups criticize contract to sell power to Central Electric Co-op at less than cost and suggest renegotiation. Both groups agree there has been no misuse of funds. Among other things, majority blamed long drought for authority's financial troubles. Minority saw lack of long-range financial program as main cause.

Nevada Power Use—Speaking at San Francisco Electrical Club, Dunlap D. Smalley, vice president and operating manager, Southern Nevada Power Co, said average residential use is over 10,000 kwhr. Total energy use in 1955 was up 40% and demand up 33⅓% over 1954. Total demand was 140,000 kw in 1955.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Rep Sterling Cole again has urged elimination of compulsory licensing provision of Atomic Energy Act. He argues that compulsory licensing is violation of constitution, that it does violence to patent system, that it is "dangerous precedent." Joint Committee on Atomic Energy will hold hearings next month on Cole's bill to repeal this provision of act.

Pres Eisenhower's willingness to run again if his health holds out means he probably can save part of his legislative program. It offer fresh hopes for Republicans to seize control of Congress next year. But odds are better for GOP to win House than the Senate.

Westinghouse Strike—Westinghouse directors at regular meeting last week again reaffirmed approval of position taken by management in lengthy negotiations during strike by IUE and UE. This was fourth time directors gave unanimous and unqualified support to management. Earlier, Pres Gwilym Price had met with federal negotiators in what were termed "cordial" talks.

Copper Price Pressure—Chile last week asked copper companies to increase U. S. price of copper from 46¢ to 48¢ a lb. Action follows boost of African copper prices to slightly over 48¢ on London Metals Exchange.

Merger Proposed—Under encouragement from Hawaii PUC, the two power companies on Hawaii—Kona L&P and Hilo Electric—have agreed to merge. Smaller Kona L&P had turned down offer last year of 8,000 Hilo shares in exchange for its shares and has now accepted offer of 8,620 shares with market value of $258,000.

The Northwest—Cowlitz County (Wash.) PUD has sought FPC permission to intervene in Pacific P&L's application for license to build 250,000-kw Swift hydro project on Lewis River . . . Portland GE will open bids March 16 for construction of Pelton Dam and powerhouse.

Rate Increase—Massachusetts commission has authorized Cape & Vineyard Electric to increase rates $318,000 (7.2%) a year.

ABOUT PEOPLE IN THE INDUSTRY

Pres Philip Sporn of American G&E last week announced $700 million expansion program for company to add 2.6 million kw in 1956-60. "Our new program—larger than anything we have ever undertaken before—underlines in terms of concrete action our confidence in potential growth of region in which we operate," he said. Power use on system is expected to increase fourfold in next 20 years, he added.

Tampa Electric's load has doubled in past five years and is expected to double again in next five, Pres W. C. MacInnes told New York Security Analysts last week. Capital improvements, he noted, will jump from average $7 million a year in past three years to $15 million a year in next three. System now has over 300 heat pumps of which 84 were installed in 1955. Big increase is anticipated in 1956.

More News About People page 170

High Court Upsets Rate Hike Practice for Long-term Pacts

JUSTICE JOHN M. HARLAN

- **Utilities cannot make unilateral increases in power rates which are fixed in long-term contracts, says last week's decision made on West Coast case**
- **FPC, before approving such increases, must find public interest affected because old rates are so low that utility's alibity to serve is impaired**
- **Ruling upsets interpretation of Federal Power Act by FPC and raises questions affecting past and future rate increases filed with federal agency**

The U. S. Supreme Court last week ruled that the Federal Power Act does not authorize electric utility companies to make unilateral increases in power rates fixed in long term contracts. The court also ruled that before the Federal Power Commission can approve such increases, it must find that the old contract rates are so low as to impair the utility's ability to serve.

The decision upsets the interpretation of the Federal Power Act by the FPC. It throws back to FPC a complicated batch of legal problems and raises big question marks over past and future rate increases filed with FPC.

Specifically involved in the high court's ruling are Pacific Gas & Electric Co and the Sierra Pacific Power Co. Sierra, which distributes electricity to consumers in northern Nevada and eastern California and buys about 77% of its power from PG&E, raised the issues in the federal courts after FPC had rejected its arguments against a unilateral rate increase by PG&E.

Sierra, back in 1947, began negotiating for other sources of power when it was faced with increased post-war demands and consumer pressure for cheaper power. One of the sources it considered was the Interior Department's Bureau of Reclamation which then had unused capacity at Shasta Dam. In order to keep Sierra as a customer, PG&E offered a 15-year contract for power at a special low rate; Sierra accepted the contract in 1948.

Rate Upped in 1953

Then early in 1953, PG&E—without Sierra's concurrence—filed a schedule with FPC to raise its rate to Sierra approximately 28%. The power commission began a hearing to determine the reasonableness of the new rate and allowed the proposed rate increase to become effective as of September, 1953.

Sierra was allowed to intervene, but despite its argument that PG&E could not change the contract by its own action, FPC in 1954 held the new rate was not "unjust, unreasonable, unduly discriminatory, or preferential." These are the standards set in the law for passing on changes in power rates.

Sierra carried its case to the Court of Appeals for the District of Columbia, which reversed the FPC on the grounds that the contract rate could be changed only after a finding that it was unreasonable.

It was this decision which PG&E and FPC appealed to the Supreme Court. Justice John Marshall Harlan, who wrote the court's 9-0 opinion, held that neither filing of the new rate by PG&E nor FPC's approval of the new rate were effective to change PG&E's contract with Sierra.

Harlan also wrote a related decision rejecting similar interpretations of the Natural Gas Act by FPC in a case decided the same day. The provisions for filing schedules are similar under both the Natural Gas Act and the Federal Power Act, and Harlan applied the same reasoning in both cases on this point.

In the natural gas case, Harlan held that the provisions in the law for filing new rate schedules do not give the regulated companies power to change their contracts with customers. These sections are, he said, "simply parts of a single statutory scheme under which . . . all rates are subject to being modified by FPC upon a finding that they are unlawful."

But the PG&E case raised a further

(*Continued on page* 77)

Civilian Atom Development Pushed

- **President, Congressmen, officials promote stepped-up peacetime program**
- **40,000 kg of U-235 released for civilian reactor programs here and abroad**
- **Legislation in mill provides government insurance aid for private plants**
- **AEC's Murray stresses atomic development for peace rather than for war**

President Eisenhower, Congressmen, and government officials are pushing hard for increased civilian use of atomic energy—mostly for electric power.

• The President recently freed enough nuclear fuel from the military stockpile to support civilian reactor programs here and abroad ten times the size of that presently planned by American industry.

• Rep Melvin Price (D-Ill.) drew up legislation to set up a government-sponsored atomic liability insurance program to help cover private installations.

• Commissioner Thomas Murray of the Atomic Energy Commission warned that the U. S. is losing out to the Soviets in the peacetime industrial atomic race and urged a 10-year, $1-billion-a-year federal nuclear power program.

Eisenhower's offer involves sale or lease of 20,000 kg of the fissionable uranium, U-235, to nations participating in agreements with the U. S. His announcement indicated the possibility that some of the fuel would be earmarked for the United Nations atoms-for-peace agency, and EURATOM, the 12-nation European atom pool, as well as individual nations who sign bilateral agreements with us.

His program makes available a like amount for U. S. reactor builders.

Large-Scale Program Seen

Magnitude of the reactor program which the 40,000 kg of fuel would support appears considerable. For the half-dozen central station atomic power plants proposed by industrial groups in this country, plus the government's experimental reactor program at AEC installations, would demand only slightly more than 2,500 kg of U-235 for initial reactor core loadings. This program involves a total fuel cost of little more than $65 million and would result in nuclear generating capacity totaling less than 800,000 kw.

The fuel made available by Eisenhower is worth about $1 billion, based on the $25-per-gram price charged foreign recipients, and could easily support a combined U. S.-foreign construction program of 10-million kw of nuclear capacity.

Both Eisenhower's and Murray's statements make clear that U. S. atomic bomb stockpile has been amply supplied. In fact Murray, in presenting his report to the Joint Congressional Committee on Atomic Energy, declared that the ample weapons stockpile should persuade the government to concentrate more on an all-out effort to beat the Russians in the peacetime atomic race.

Murray recommended that AEC spend $1 billion each year for the next five years on federal atomic power plants here and abroad, looking toward a total generating capacity of 2-million kw by 1960 and 10-million kw between 1960 and 1965. A bill to direct AEC to get in the power reactor business by building six full-scale plants has already been introduced by Sen Albert Gore (D-Tenn.).

In promising his atom insurance bill, Price said he was not committed to its terms—that the U. S. underwrite liability risk not covered at reasonable rates by private insurance carriers during the next ten years. He said he merely wanted to "get out in the open" a problem brought up by some of the biggest utility leaders (EW, Feb. 27, p 8).

Congress was told recently that insurance companies' offers to underwrite $60 million in liability on each atom power plant was inadequate to encourage any large utility system to risk its solvency to participate in a reactor development program.

Price said he would ask the joint committee to schedule early hearings on his bill to pinpoint the scope of the problem.

Bids on Foreign Atom Plants

. . . made by six U. S. companies for American & Foreign Power Co's three 10,000-kw stations

Proposals have been received from six manufacturers for the three 10,000-kw nuclear power plants American & Foreign Power Co will build in Latin America.

Companies responding were: Alco Products, Inc; AMF Atomics, Inc, a subsidiary of American Machinery & Foundry Co; Babcock & Wilcox Co jointly with Allis-Chalmers Manufacturing Co; International General Electric Co; North American Aviation, Inc; and Westinghouse Electric International Corp.

"The response we received is very encouraging," said Henry B. Sargent, American & Foreign Power president. "It shows real industrial interest in the application of nuclear power. We are considering each proposal seriously."

An evaluation of the bids is being made by Ebasco Services, Inc, who, with Ebasco International Corp, will make recommendations on the selection of the proposal or proposals to be accepted.

Although American & Foreign Power Co is considering the selection of different plants from these manufacturers, a single manufacturer may be selected to supply three identical plants, A & FP reported.

In reaching its decision to purchase the three plants, the company claims the lead in demonstrating how private industry, without government subsidy, may participate directly in President Eisenhower's international atoms-for-peace program. American & Foreign Power Co will announce later the three plant sites to be chosen in the 11 Latin American countries in which it operates.

Dispute SPA 40% Rate Hike

. . . as Aandahl, Kerr clash over pending wholesale increase to cooperatives; Interior's method of cost allocation attacked

Interior Department officials and Congressmen clashed last week over a forthcoming 40% increase in Southwestern Power Administration wholesale power rates.

Assistant Secretary of the Interior Fred G. Aandahl and other Interior power specialists were called in for questioning on the pending rate hike by a joint House-Senate public works-interior subcommittee headed by Sen Robert H. Kerr, (D-Okla.). Kerr invited House members from southwestern states to sit in as guests.

A new SPA rate schedule containing the increase was readied by Interior about three weeks ago. It was designed to supercede a previous application submitted to the Federal Power Commission a year ago (EW, Jan. 24, 1955, p 113). Submission of the new schedule was held up pending the current hearings.

The new schedule contemplates a demand charge of $1 per kw, an energy charge of 3.5 mills per kwhr for the first 150 hours of demand and 6 mills per kwhr for all additional energy. An average rate of 7.71 mills per kwhr at 50% load factor results.

SPA's withdrawn application would have raised rates from the existing average of 5.6 mills per kwhr to about 7.1 mills. Aandahl said this would not have sufficed to cover additional costs involved in renewal of SPA agreements to buy power from large Southwest co-ops and would not cover revised cost allocations for federal dams from which SPA markets.

These rates govern SPA power sales to rural electric cooperatives in Arkansas, Missouri, Oklahoma, Louisiana, and Texas. Average power costs to the consumers served by these co-ops is 40 mills per kwhr. Aandahl said the 40% wholesale rate increase now contemplated would raise this to an average of 42.5 mills.

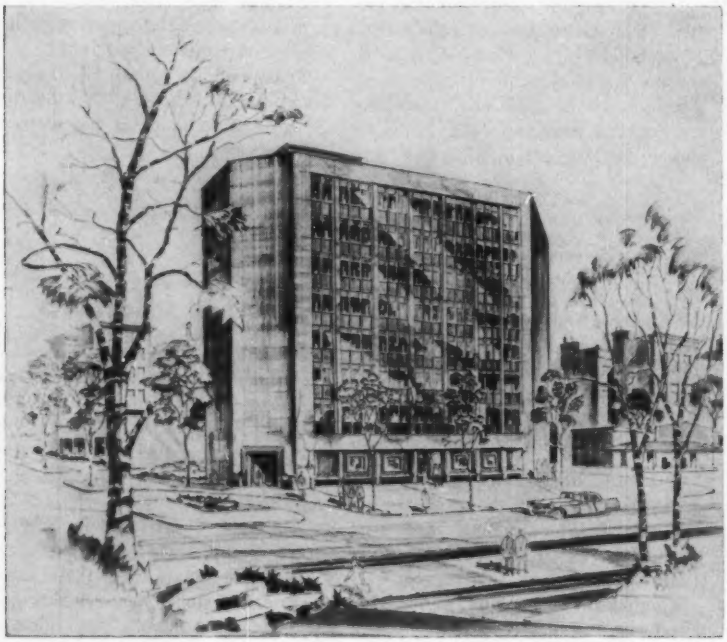
Allocation Methods Questioned

While the magnitude of the rate hike touched off the new hearings, actually the investigation is a continuation of one conducted last year by the House Interior Committee which concerned Interior's new method of allocating costs among the uses of federal multi-purpose water projects. Last year, the House group concentrated its fire on Budget Bureau Circular A-47, new but still unofficial guide to federal agencies regarding factors to be considered in cost allocations. Kerr has touched upon A-47, but his attack so far has centered on Interior's so-called "separable costs—remaining benefits" method of cost allocation.

New Factors Included

Under Interior's new method, other factors are considered in addition to this "incremental" cost of including power features in a federal multi-purpose project. These include an estimate of the savings obtained by combining the several water functions in one large project (as opposed to building a separate facility for each function) and the value of the benefits received from each function.

This method is one long used by the Army Corps of Engineers; before Interior adopted it, on March 12, 1954, the Bureau of Reclamation and other Interior agencies which market power for Corps-built dams had used a method which resulted in lower power costs. That was because costs of power features of federal projects had previously been computed by simply removing them, theoretically, from the project, and estimating remaining costs of the project without them. When this was done, the difference in investments was considered the amount to be reimbursed by power users.



New NRECA Headquarters Going Up

Construction is underway on an eight-story headquarters building for the National Rural Electric Cooperative Association in Washington, D.C. Loan pledges from 338 rural electric systems accounted for $778,336 of the structure's estimated cost which is not expected to exceed $900,000.

NRECA will use $180,000 of its reserve fund to supplement loans from its member systems. The reserve will be used on initial construction so members' loans can be repaid quickly if they need the money.

November, 1956, has been tentatively set as occupancy date. About 26 offices will be rented to outside interests.

Foreign Transformers Fail

. . . at dedication of Army Corps' Garrison Dam; power delayed a week; equipment manufactured by Ferranti, Ltd, of England

Formal dedication ceremonies at Army Corps of Engineers' Garrison Dam in Riverdale, N. D., were held late in January. Gov Norman Brunsdale pressed the starting button, and the 80,000-kw No. 1 turbine and generator began turning. But the power produced didn't go anywhere.

During test two days before dedication, one of the three 33,333-kva transformers failed, Col Stanley G. Reiff of the Engineers' Technical Liaison Division in Washington, D.C., stated. The damaged transformer and eight others were furnished by Ferranti, Ltd, of England, said Colonel Reiff.

These details of the mishap were furnished by Jack A. Bailey, chief of technical liaison for Engineers' Garrison District: "Trouble was caused by the tap-changing unit. 'A' and 'B' phase transformers were set on No. 3 position, while 'C' phase was set midway between 2 and 3 position. When the voltage was slowly built up to 13.5 kv, the contacts were burned and an 'arcing' effect developed with possible damage to the transformer winding."

The transformer originally slated for No. 3 unit was substituted for the damaged one, and Garrison power went on the line a week after schedule, Bailey said. The damaged transformer was shipped to Ferranti's plant in Toronto, Canada, for examination and repair, Bailey noted.

Meanwhile, Colonel Reiff declared that Corps of Engineers is "making an investigation to determine the nature and cost of the damage" and to place the responsibility.

Work is proceeding as scheduled on generators No. 2 and 3. The second will go on line between now and June, and the third sometime in June.

Supreme Court Upsets Rate Hike Practice

(*Continued from page* 74)

question. Under the Federal Power Act, FPC can change contract rates whenever it determines such rates to be unlawful. FPC and the utility argued before the Supreme Court that this finding had been made by the commission and that it was immaterial, legally, whether FPC's investigation was begun as one into the reasonableness of the proposed rate rather than into the existing contract rate.

Basis for Argument

The basis for this argument was certain material developed in the proceedings before FPC. The commission found that 5.5% was normally a "fair return" on PG&E's operations; the old contract rate with Sierra would produce only a 2.6% rate of return; and the proposed rate would produce a 4.75% rate of return.

Although FPC decided it did not have to rule on the old contract rate, it did include a statement in its order that any rate producing a return substantially less than the 4.75% resulting from the proposed rate would be "unreasonably low and therefore unlawful." FPC also pointed out that the proposed rate was the minimum which PG&E was willing to accept.

Harlan rejected the FPC-PG&E argument that this amounted to a finding that the contract rate was unreasonable. He said such a conclusion "on its face is based on an erroneous standard," since it amounts to a holding that the contract rate was unreasonable solely because it yields less than a fair return on the net invested capital.

Harlan made a distinction by pointing out that FPC may not normally "impose on a public utility a rate producing less than a fair return." But, Harlan said, "this does not mean that a utility may not itself agree by contract to a rate less than a fair return, or that if it does so, it is entitled to be relieved of its improvident bargain."

Public Interest Stressed

Where this happens, Harlan said the FPC's sole concern is whether the contract rate is "so low as to adversely affect the public interest . . . where it might impair the financial ability of the public utility to continue its service, cast upon other consumers an excessive burden, or be unduly discriminatory."

This is the test the Supreme Court says the power commission must now apply before permitting increases in contract rates, where a purchaser with a contract does not go along. Harlan said it is clear that the purpose of the power given FPC over contract rates is the "protection of the public interest, as distinguished from the private interests of the utilities." For that reason, Justice Harlan ruled that FPC could not say the PG&E-Sierra contract was either unjust or unreasonable "simply because it is unprofitable to the utility."

The case now goes back to FPC. Just what happens next is not clear. The Supreme Court turned the case back for such further proceedings as FPC "may deem desirable." Presumably, this means FPC can now undertake to determine whether or not the PG&E-Sierra contract is so low as to have an "adverse effect" on the public interest. If so, then there is the further problem whether such a finding can be applied retroactively, to cover the period since 1953 when the higher rate went into effect.

And if FPC decides it can do nothing but reject the higher rate—in whole or in part—there is the difficulty of deciding on refunds. The increase has been estimated to amount to $419,000 for the year 1953 alone.

FPC expects similar cases to arise but there are no pending power cases before the agency in which the same issue is involved.

Power Sales Reprints

Reprints of "How Electricity Boosts Industrial Output" are available for utilities to distribute to industrial customers to promote greater use of electricity. This 16-page EW report begins on page 87.

PSC Seeks Regulation of St. Lawrence Rates

New York State Public Service Commission has asked the legislature to transfer the State Power Authority's control over consumer rates for St. Lawrence River power to PSC to avoid "complete confusion" for consumers.

PSC, in a memorandum to the Governor, legislative leaders, power authority members, and state officials, urged passage of the Hughes-Fox bill which would give the commission these rate-regulating powers. Unless this bill is enacted, said PSC, "The only certain prospect is regulatory chaos."

The Power Authority recently claimed that rate regulation and service supervisory powers by PSC would impair the authority's financial stability and would prevent it from meeting its obligations to bondholders and contracts. PSC said the argument was "wholly without merit."

Utility Company Holdings Sought by Nogales, Ariz.

A fight for municipal ownership of holdings of the Citizens Utilities Co has been launched at Nogales, Ariz. And the firm of R. W. Beck & Associates, Seattle, Wash., has been hired to make a survey of city electric and gas holding valuations.

The move came as a result of the city's request for a rate reduction which Citizens maintained was not possible.

Mayor Jose S. Colunga outlined the city's position by stating, "My administration has been swamped with complaints. Before taking this firm action I wrote to Richard L. Rosenthal, president of the Citizens Utilities Company, to obtain more reasonable electric and gas rates. The answer I received was unsatisfactory. Mr Rosenthal pointed out in his reply why the rates could not be lowered and even indicated higher rates.

"No other avenue is left to the city but to start the procedure."

Citizens Utilities Co pays about $72,000 a year in taxes to the city.

Rosenthal, in a letter to Nogales City Attorney Nasib Karam, accused the city of deceit, of attempting to fast-shuffle the utility sale onto the people, and of malpractice of utilities which the city already controls.

He also confirmed reports that employees of the Seattle firm, hired to make a survey of Citizens' properties, had been ejected from company property.

The Nogales city council had not given the public the full story of survey costs, Rosenthal stated. A figure of $5,500 originally was announced. But Rosenthal said this was just a "down payment" and that full cost to the taxpayer would be $20,000 for the survey.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING DECEMBER

State	Utility	Plant	Fuel	Capacity
Me.	Central Maine Power Co	Harris	H	30,000
N. Y.	Rockland Light & Power Co	Lovett	S	66,000
N. Y.	Rockland Light & Power Co	Grahamsville	H	18,000
Ohio	Columbus & Southern Ohio Electric Co	Picway	S	100,000
Ohio	Ohio Valley Electric Corp	Kyger Creek	S	180,000
Ohio	City Sewage Treatment	Columbus	IC	1,250
Ill.	Commonwealth Edison Co	Railway Unit	IC	1,000
Wis.	Wisconsin Electric Power Co	Oak Creek	S	120,000
Minn.	Northern States Power Co	Hennepin Is.	H	2,500
Mo.	Poplar Bluff Board of Public Works	Poplar Bluff	S	1,700
Neb.	Wakefield Light & Water Dept	Wakefield	IC	675
Kans.	Kansas City Board of Public Utilities	Kaw	S	40,000
Kans.	Wamego Municipal Light & Water Dept	Wamego	IC	1,140
Kans.	Western Light & Telephone Co	Mullergren	S	16,500
N. C.	Virginia Electric & Power Co	Roanoke Rapids	H	25,020
Ga.	Georgia Power Co	Goat Rock	H	5,000
Fla.	U. S. Naval Air Training Center	New	S	15,000
Tenn.	Tennessee Valley Authority	Kingston	S	180,000
Colo.	Southern Colorado Power Co	Canon City	S	16,500
Calif.	Bureau of Reclamation	Folsom	H	54,000

RETIREMENTS

N. H.	New Hampshire Electric Co	New Market	H	650
Mass.	Central Massachusetts Electric Co	Blanchardville	H	375
Mass.	Worcester County Electric Co	Webster	S	7,200
Conn.	Connecticut Power Co	Unionville	H	1,850
N. Y.	Arcade Municipal Electric Dept	Arcade	IC	700
Pa.	Chambersburg Municipal Electric Light Dept	Chambersburg	S	1,000
Ind.	Public Service Co of Indiana, Inc	Edwardsport	S	7,500
Ind.	Columbia City Light & Water Dept	Columbia City	S	6,000
Ind.	Indiana & Michigan Electric Co	Muncie	S	10,000
Minn.	Roseau Municipal Water & Light Plant	Roseau	IC	250
Minn.	Dairyland Electric Cooperative, Inc	Remer	IC	233
Mo.	Poplar Bluff Board of Public Works	Poplar Bluff	S	1,000
Mo.	Salisbury Municipal Utilities	Salisbury	IC	1,481
S. D.	Northwestern Public Service Co	Redfield	S	200
S. D.	West Central Co-op	Murdo	IC	100
S. D.	West Central Co-op	Midland	IC	190
Neb.	Wakefield Light & Water Dept	Wakefield	IC	160
Neb.	Consumers Public Power District	Neligh 2	IC	400
Neb.	Consumers Public Power District	O'Neill	IC	981
Kans.	Neodesha Municipal Light & Power Dept	Neodesha	IC	375
N. C.	New Bern Municipal Electric System	New Bern	IC	6,000
N. C.	French Broad Electric Membership Corp	Burnsville	H	474
Ga.	Georgia Power Co	Arco	S	1,500
Fla.	Fort Meade Electric Dept	Ft. Meade	IC	380
Fla.	Public Utility Dept	St. Petersburg	IC	2,100
Ark.	Clarksville Light & Water Co	Clarksville	IC	750
Okla.	Claremore Municipal Light & Water Dept	Claremore	IC	1,350
Okla.	Miami Dept of Public Utilities	Miami	IC	740
Colo.	Southern Colorado Power Co	Canon City	S	4,580
Ariz.	Tombstone Light & Power Plant	Tombstone	IC	265
Utah	Spring City Municipal Power Plant	Spring City	H	60
Utah	Spring City Municipal Power Plant	Spring City	IC	40
Wash.	Public Utility District 1, Clallam	Forks	IC	1,025
Calif.	California Electric Power Co	San Bernardino	S	5,000

U. S.	Hydro	Steam	IC	Total
Added	134,520	735,700	4,065	874,285
Retired	3,409	43,980	17,520	64,909
Adjustments Plus	60	15,000	268	15,328
Adjustments Minus	1,200	1,145	787	3,132
Net Change	+129,971	+705,575	−13,974	821,572

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of January 1—Hydro, 24,937,859 kw; Steam, 87,082,320 kw; IC, 2,351,217 kw; Total, 114,371,396 kw.

New Plastic Poles Are Being Tested

Fiber glass utility poles for power lines may prove a revolutionary development in the electric distribution field now almost exclusively confined to wood poles, if present experiments prove feasible.

A test line has been in operation by Consumers Power Co for more than a year near Alma, Mich.

A special demonstration of the line and test methods will be held for the press and technical writers within a few weeks. Operating and performance characteristics thus far developed will be demonstrated at the Alma Division Service Center of Consumers, followed by an inspection of the experimental line and demonstrations of pole setting, pole climbing and other field work.

The experimental poles were produced by Gar Wood Industries of Wayne, Mich., in conjunction with Consumers' engineers. Line Material Co of Milwaukee, Wis., has been appointed sales representative.

Advantages shown by tests thus far indicate that the poles are impervious to rot and moisture, and immune to the bane of utility men: Woodpeckers and termites. For practical purposes, the fiber glass structure also makes them lightning-proof. Their use also ends unsightly signs tacked on poles.

Easier Handling, Added Strength

Two men can lift them, as compared with the usual six for ordinary poles. The experimental poles in a standard 35-foot length weigh only 150 lb, as compared with 450 lb for cedar and 750 lb for pine poles. They are hollow cylinders or tubes of fiber glass and plastic, 11 in. in diameter, capped at each end. Their strength is said to be equal to low-carbon steel, even with tubular walls only ¼ in. thick. The designers point to the comparative strength of "glass" fishing rods as indicating the strength feature.

The makers say they can be produced in many colors, such as green, red, blue or other shades. Present test poles are mahogany colored.

Since they cannot be pierced by nails, the familiar lineman's climbing spurs are unnecessary. In their place, the lineman places metal bolt-like "steps" into holes manufactured in the poles, beginning 8 ft from the ground. The "steps" are removed by the lineman as he descends.

HARDWARE IS EASILY AND QUICKLY ATTACHED TO NEW PLASTIC POLES

LINEMAN INSERTS POLE STEPS IN "BUILT-IN" HOLES AS HE CLIMBS

CONSUMERS POWER WORKS ON TEST INSTALLATION OF 35-FT POLES

"We Must Interpret: 'What Is Going On in Washington . . .' "

How Barnett Sees NAEC Capital Role

"We do not buttonhole Congressmen"

The election of Arthur R. Barnett, new director of the National Association of Electric Companies, reflects a basic change taking place in the relationship between industrial organizations and government.

Barnett is a trained research economist, a fact which indicates the present-day aim of the organization.

"We have one great responsibility," Barnett says. "We must interpret what is going on in Washington for the benefit of NAEC members so that they in turn can keep the people of their service areas and elected representatives from those areas informed of their views. This is a vital function, as a policy decision made in Washington invariably becomes an operational problem affecting companies as going business concerns.

"We do not buttonhole Congressmen. We try to cut through the mass of available material, correctly evaluating and interpreting the positions of others, and contributing to a constructive presentation of our position."

Barnett, 47, heads up a staff of 16 at NAEC. He knows Washington. After obtaining his AB at Hiram College in his home state of Ohio—major economics, minor in government—he completed four years of graduate work at Cornell. Then he came to Washington as a Brookings Institution fellow.

He worked for a time as an Agriculture Department economist and in 1937 joined the research division of the Republican National Committee. He became the committee's research director in 1941, and in 1942 entered public relations work with Stephen Walter & Associates.

In 1945 Barnett joined the NAEC as director of research and secretary. He became secretary-treasurer, and last August was named active director. On Dec. 13, 1955, the NAEC Board of Directors appointed him director, succeeding P. L. Smith. Robert G. Litchert is the new secretary-treasurer.

Barnett views the Washington complex which is our federal government above all as a technical problem which demands a clear understanding of

Washington is an "exceedingly complex grouping" of factors

issues. "Washington is not simply a political jumble," he says. "It is an exceedingly complex grouping of financial, operational, engineering, legal, and human factors, arranged in an orderly manner that makes a considerable amount of sense.

"But it requires a high degree of understanding to reduce the vast amount of material and opinion to clear-cut definitions of actual issues. It is the use of this understanding in presenting to our companies a clear and informed approach to these problems that is important.

"We try to supply NAEC members with a real picture of what is at stake in Washington, and what is being done about it, so that they can make certain everyone interested is aware of their views.

"This is the key to our function," Barnett believes. "The problems which arise in government soon relate themselves to utility operations, not just to politics. They demand explanation from those who know them best—the men on the job at the company level.

"Thus, NAEC becomes the medium through which electric companies are kept informed of matters as they come up here in time to permit them to make their views known to those who make decisions."

There is a third aspect of this information exchange which the new director emphasizes—the importance of an informed public. "To try to add to the understanding of policy problems is one of our major functions," he says.

In carrying out its responsibilities to member companies, NAEC takes advantage of many avenues of gathering and distributing the information it obtains. Its routine services include periodical summaries of significant legislature developments, analyses of the background and prospects for the programs in which utilities have an interest, including projects of the administration. The NAEC staff provides counsel to members on legislative problems, and its facilities are available to representatives of NAEC companies.

To help "understanding of policy problems is one of our major functions"

Tries AAAC Primaries Near Coast

Central Maine makes two experimental installation of all-aluminum-alloy conductor in distribution lines

J. B. ROCHE, Distribution Engineer, Central Maine Power Co, Augusta, Me. and **W. H. BEARCE,** Assistant Chief Engineer, Electrical Conductor Division, Kaiser Aluminum & Chemical Sales, Inc, Chicago, Ill.

All-aluminum conductors stranded from a new high-strength alloy have been used by Central Maine Power Co for two long-span distribution lines which otherwise would have been conductored with ACSR. Field experience and laboratory tests indicate six advantages for the aluminum-silicon-magnesium-alloy conductor:

1. Splicing is easier, requiring only one compression sleeve.

2. Deadening requires no separate grip to hold a steel core.

3. Repairing broken conductors in emergency is speeded by use of automatic splices and deadends.

4. Substituting aluminum-alloy core wire for the steel used to strengthen ACSR cuts conductor weight about 20%.

5. Keeping all metal homogeneous in the stranded conductor eliminates the conditions for galvanic corrosion between strands.

6. Non-magnetic material in the conductor eliminates magnetic losses and cuts ac resistance at full load almost to the dc value. Lower I^2R losses give it about 10% higher current capability than its equivalent ACSR.

Use of aluminum for distribution by Central Maine had been avoided because of expected trouble in splicing and handling. But growing load requirements in 1950, when war-time shortages made copper hard to obtain, warranted another look at aluminum. Trial installations of 336,400-CM all-aluminum conductor (EC grade) proved successful in place of 4/0 copper on a 4,160-v grounded-Y line. Many additional installations followed. Heat-seated polyvinyl tape replaced weatherproof braid for these installations.

Many operating districts acquired the necessary equipment and working knowledge to install the large conductor. When applications were encountered where the large conductor could not be justified, bare 1/0 ACSR for 7.2/12.47-kv circuits was tried.

Size and Strength of AAAC Conductor Resemble ACSR, but Weight Is Less

AAAC

CM	Dia-In.	Stranding	Resistance, Ohms/1,000 ft, 20 C, 60 cps	Reactance, Ohms/1,000 ft 1-ft spacing, 60 cps	Breaking Strength, lb	Weight, lb/1,000 ft
48,110	0.249	7/0.0829-in.	0.4137	0.1124	1,700	44.9
76,440	0.314	7/0.1045-in.	0.2602	0.1071	2,700	71.4
121,400	0.395	7/0.1317-in.	0.1635	0.1017	4,290	112.4

ACSR

Size, AWG	Dia-in.	Stranding	Resistance, Ohms/1,000 ft, 25 C 60 cps	Reactance, Ohms/1,000 ft, 1-ft spacing, 60 cps	Breaking Strength, lb	Weight, lb/1,000 ft
No. 4	0.250	6/1	0.4242	0.1157	1,830	57.4
No. 2	0.316	6/1	0.2662	0.1121	2,790	91.3
1/0	0.398	6/1	0.1674	0.1076	4,280	145.2

This brought complications, bare aluminum requiring more careful handling than copper to avoid mechanical damage. The ACSR also required double sleeves for splicing.

Permits Single Sleeves

Solution to both difficulties seemed inherent in the new aluminum-silicon-magnesium-alloy conductor designated AAAC. Its Brinell hardness of 85 approaches that of hard-drawn copper at 100 and permits similar installation methods. Its fabrication of homogeneous strands permits splicing with single sleeves. Installation techniques and costs were checked by building two experimental lines, one of 1½ miles in South Portland in March 1955 and the other some 4½ miles in Lincolnville in May. The 1/0 AAAC on both lines has approximately the same diameter and breaking strength as 1/0 ACSR.

The South Portland line is in a rural area, free from industrial atmospheric contamination, about six miles south of the Portland City Hall and ¼ mile south of the local headquarters of the U. S. Weather Bureau. The line runs east-west and is about 1½ miles from the Atlantic Coast and ¼ mile from a salt-water bay. Prevailing winds are offshore, and the terrain is rolling. This location permits evaluation of the line under known weather conditions.

One Line Serves Island

The second installation was rebuilt from a rural single-phase line to feed a new 3-phase, 4-wire submarine cable serving Islesboro, a large island about two miles offshore in Penobscot Bay.

Construction experience showed that it was practicable to pull in a full reel of AAAC, 6,000 ft, and that some auxiliary equipment used with ACSR was unnecessary. Full-tension splices were made with single sleeves applied with a compression tool. The conductor was installed on existing poles. The average span was slightly over 200 ft, the maximum running up to about 300 ft, and sag conditions compare favorably with ACSR. In general, the poles are used jointly with the telephone company.

Crossarm Rollers Used

Crossarm rollers were used for pulling in 2-phase wires, the conductor being kept off the ground by blocking over rocks, shrubs, and other obstructions. The third phase was pulled in by dragging it across the arms, through brush and over rocks just as copper is installed by some utilities. Examination of the third conductor after installation revealed no scratches or score marks such as would ordinarily be found on EC aluminum conductors subjected to such rough treatment.

The new alloy conductor has a volume conductivity of 52 to 53% IACS and an average strength of 43,000 to 45,000 psi, depending upon the size of the completed conductor. The equivalent 1/0 ACSR, with 170,000

(*Continued on page* 160)

Chart 1—Preliminary Design Sags and Final Tensions for No. 1/0 Equiv. AAAC

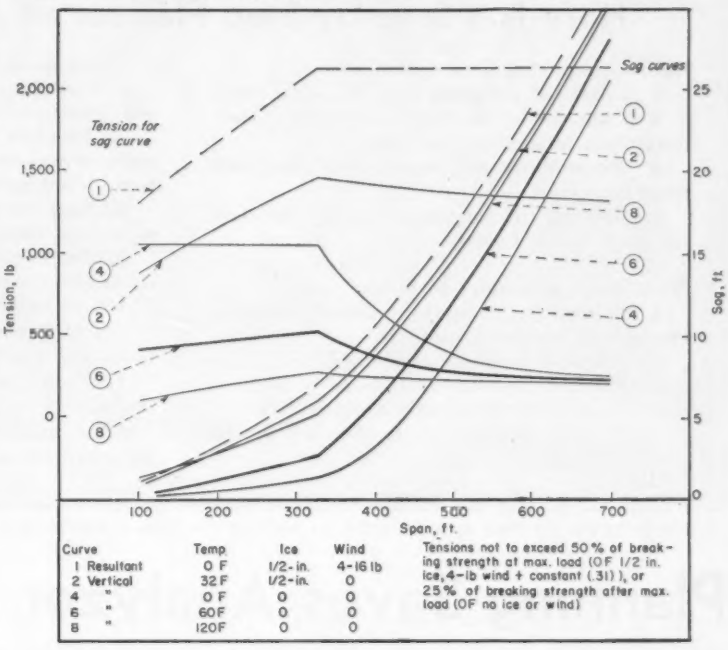
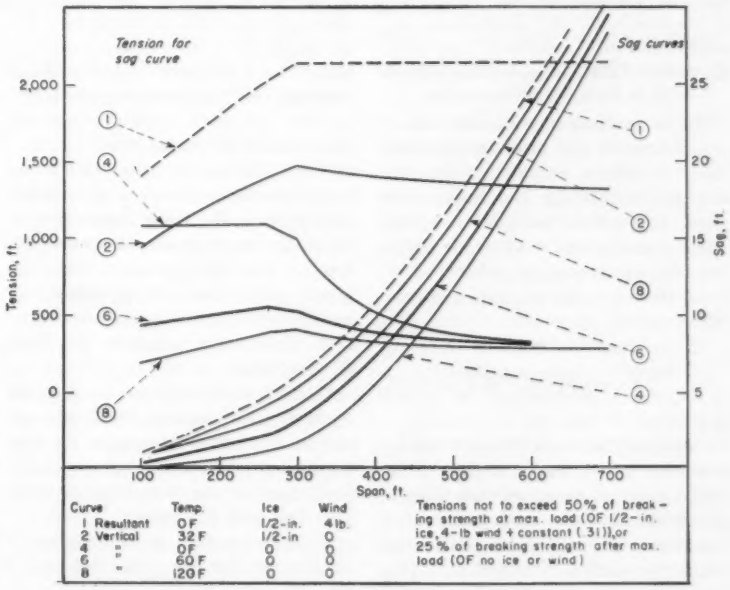


Chart 2—Design Sags and Final Tensions for No. 1/0, 6/1 ACSR



Here Is a Step-by-Step Plan for an Analyzer Study

Before preparing data remember:

- **A detailed program is to be established.**
- **It should be flexible enough to permit deviations in analyzer set ups.**
- **The analyzer will answer only the questions it's asked.**
- **Accuracy of answers depends on data supplied to the board.**

With those principles in mind:

1. Determine company policy regarding emergency service conditions.

2. Tabulate questions to be asked.

3. Discuss questions and alternate plans at a conference of all interested departments.

4. Prepare board sheets, showing details and equivalents for parts of the system.

5. Estimate future loads in watts and vars.

6. Calculate line impedances using the best choice of kva base.

7. Tabulate line impedances of usual conductors and configurations to speed calculations when new schemes are tried.

8. Tabulate constants for converting lines to higher voltages.

9. Prepare realistic voltage, var, and watt schedules for each generating station.

10. List characteristics of equipment.

11. Organize tests to save time adjusting loads and generation.

12. Take four to six men on an analyzer study.

13. Consider the ability of the chief operator when selecting an analyzer.

Planning Saves Analyzer Time

SYSTEM ENGINEERING
Planning

Virginia Electric & Power Co finds results are more accurate and complete when a detailed program precedes each board study

C. L. GILKESON, Senior Engineer, Virginia Electric & Power Co, Richmond, Va.

In an analyzer board study there is no substitute for thorough preparation. It almost entirely governs the outcome. Although the human element also effects the results, a little extra planning and work, done before the analyzer is plugged, will:

1. Provide more accurate and complete results.

2. Save analyzer time.

3. Simplify study procedure.

4. Provide convenience in recording data.

Virginia Electric & Power Co never makes a board study without a detailed program itemizing each test and never finishes the program without omissions and additions. This illustrates the cardinal concept of a plan as "an orderly procedure from which one may deviate intelligently."

For the most part, the following discussion pertains to load-flow studies—the most common type.

In making a load-flow study, a network analyzer helps solve the many complicated problems rapidly. But it answers only the questions asked, and answers are only as accurate as the information the board gets.

Thus, the starting point in a board study appears to be the determination of questions. But, prior decisions must be made on what are acceptable answers. For these answers the company's policy must be formulated for such emergency service conditions as:

1. How much reduction in voltage is acceptable?

2. Should the system be designed to supply this voltage during an outage of more than one major piece of equipment, such as the outage of two generators or the loss of a transmission line and generator?

3. Is the system to be designed to protect against the total loss of a double circuit line?

4. Does the emergency voltage limitation apply immediately after the failure of equipment, only after transformers can be removed from service and taps changed, or after cold generators can be put on the line?

With these decisions available, analyzer questions can be formulated from several sources. Some questions may be carryovers from previous studies that revealed weaknesses not serious enough to require prompt action. Others may grow out of operating difficulties. Most frequently, estimated loads indicate the need for a new generator, and its location must be determined. Often an area analysis of loads and resources aids in defining problems to be studied.

After the problems have been defined and questions established, it is highly desirable to formulate alternative plans to be studied at a conference of all interested departments. At this conference some suggestions may be eliminated on the basis of cost or physical limitations and alternate solutions proposed. This makes for a better board study.

Because study results are much more convincing than calculations and analysis, it is sometimes advisable to make a few extra tests. However, there is no excuse for running tests that could have been eliminated with a little analysis.

In assembling data for an analyzer study, board sheets should first be prepared. These are prints of a one-line diagram on which the analyzer

Adapted from a paper presented at the Southeastern Electric Exchange Engineering & Operation Section meeting in Charlotte, N. C.

REPRESENTATIVES OF ALL INTERESTED DEPARTMENTS MEET TO DISCUSS PROPOSED PLANS AND TO IMPROVE STUDY

readings are recorded. They should show loads, lines, generators, synchronous condensers, switched capacitors, and some transformers as well as data required for each element to be represented on the analyzer.

The diagram is laid out on a grid system to correspond with design of the plotting table. This table is plugged up with the analyzer so that a spot of light shines through the diagram to indicate the circuit connected to measuring instruments.

At the time the board sheets are prepared, decisions should be made on: What loads will be omitted and combined with other loads, what parts of the system should be shown in detail or represented as an equivalent, and how much of a neighboring system should be represented. Limitations of analyzer units may require the use of an equivalent network for a part of the system. These equivalents may be available from other board studies or can be based on other studies or on engineering judgment.

Estimating Loads

The quality of study results is largely governed by the accuracy of data given to the analyzer. Load estimates are the big factor of uncertainty, and their preparation is the time consumer. In general, peak load conditions are studied, although some problems may require a study of less than peak loads or even minimum load conditions. For instance, if the problem is to determine the transmission required to deliver the maximum output of a generating station to other load areas, less than peak loads should be used.

On Vepco's system winter peaks still control the generating capacity required, but studies are made for summer loads because the high-temperature, low power-factor loads, and accompanying voltage drops make summer loads the critical condition for transmission.

Estimates of system loads are usually expressed in terms of power at the source. From these loads estimated transmission losses are subtracted. The remaining total load must then be divided among the various loads connected to the transmission system. Small loads tapped on a transmission line are ordinarily combined with loads at the end of the line to simplify the board setup. All these loads must include both watts and vars, as modified by capacitors, either installed or to be installed. Small generation, such as scattered hydro, may be netted out to further simplify the study. Also loads connected to large generating buses may be netted out.

Line impedances require some manipulation before they can be used on the analyzer. First, they must be converted to percentages on a common kva base and a convenient, nominal voltage base. The analyzer units are rated in amperes so that the larger the kva base, the smaller the analyzer currents. If too small a kva base is selected, the analyzer generators may be overloaded; and if the base is too large, it will be hard to represent smaller loads. Therefore, the board operator should be consulted for the best choice of base.

Correction of the resistance component of line impedances is made in accordance with instructions in analyzer manuals. This correction compensates for the resistance of the reactance units of the analyzer.

A convenient method of recording impedance values is to prepare an impedance diagram on a different board sheet than used by the operator for plugging. When the board is being plugged, analyzer unit numbers are recorded on the impedance diagram to simplify setting of impedance values and correlating analyzer load numbers with system loads.

Tables Aid Calculations

During a study, new lines may be added that were not originally contemplated, or converting a line to a higher voltage may be tried. Two tabulations have proved helpful in calculating such changes:

1. A table of impedances, on a per mile basis, of usual sizes of conductors for configurations used on new construction. These values should be expressed in percentages on the kva base, with resistance corrected for the board.

2. A table of constants for converting from one voltage base to another.

Schedules, prepared for each generating station and changed as tests

PLOTTING BOARD next to instrument console has a coordinate system of lights that light up individually to indicate the location on chart being checked

may require, comprise a voltage schedule, net var limits, and total kilowatts. The schedules should be realistic and include economic loading of steam units, advantageous use of hydro energy, and equipment required for reserve or area load protection.

Because the total generation must equal the sum of loads plus transmission losses, which vary with system arrangements, one generating station on the board is designated as the "swing" station. All others are adjusted to scheduled generation. Variations are supplied by the swing station within maximum and minimum limits. If these are exceeded, changes must be made at other stations.

Voltage Schedules

The voltage schedule used at stations may apply either to the generated voltage, if load is supplied at this voltage, or to the high-tension bus in unit stations. But methods of setting up the analyzer and of determining the net var limits are different in the two cases. Where the schedule is for generator voltage, step-up transformers are usually represented. Transformer losses, therefore, are measured, and the net var capability of the station is the generator var capabilities less the var component of station power.

However, if the voltage schedule applies to the high-tension bus, it is not necessary to represent the step-up transformer; and its var loss, which is substantial, does not appear in the analyzer readings. Therefore, the loss must be calculated and subtracted from the generator capability to get the net var capability.

Importance of reliable information on var capability can be illustrated in a study to locate a new generating unit. The analyzer will show that vars tend to flow in a direction opposite to power flow when flat voltage is maintained. Generating units will be lightly loaded with vars in areas with excess generation but heavily loaded with vars in power deficient areas.

Vars Affect Generator Site

Loss of a unit in a deficient area compounds the problem because generator var capacity is lost when additional vars are required to compensate for voltage drop caused by additional power being pulled in. The generators can be relieved of some var load either by changing transformer taps or reducing voltage levels at the crippled station or by increasing voltage level at adjacent stations. If these changes, when tried on the board, do not provide sufficient relief, capacitors, synchronous condensers, or transmission must be added. Thus, the new generator location, frequently dictated by inability to relay a unit without strengthening the system, may be decided by var deficiency.

Other information that must be supplied to the analyzer consists of the impedances, initial tap settings, and available taps for all transformers to be represented. Also required are the ratings of synchronous condensers and switched capacitors.

Once questions and data are assembled, test order should be established to insure efficient use of analyzer time. Most time is consumed in adjusting loads. Therefore, all tests should be made for a particular set of loads before setting up a new schedule or changing loads. Adjusting loads requires two board operators: One sets the load impedances, the other measures the watt and var components and directs the adjustments.

The resistance and reactance units may be paralleled for loads above 5% of the kva base while for smaller loads they must be connected in series. Because much more time is required for adjusting series units than parallel units, small loads requiring series connections should be avoided.

Generator balancing for changes in schedules is next most time-consuming job. But removing or adding a line takes little time for balancing.

Six Men Ideal for Study

The composition and organization of a study team, usually four to six men, also contribute to efficient use of analyzer time. Two men should be thoroughly familiar with all information to be fed into the analyzer. They should keep one or two studies ahead so that changes in generating schedules, line rearrangements, and impedances may be ready when needed. Also, they should record all the changes.

One man should be thoroughly familiar with system operation, including system voltage levels and equipment limitations. His responsibility is to prevent tests representing impractical conditions. He should also indicate the extent of readings to be taken, thus saving time by limiting readings to a critical area or where changes have been made.

At least two "idea men" should be included. They should also think ahead of the current study so that departures from a schedule may be made with the least lost time. One new man is usually included for training. He records most of the readings.

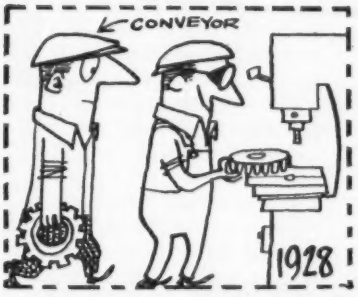
Operators Are Important

Although board operator has not been included in the study team, he is an important part of it. His ability to see that temporary changes are returned to normal often eliminates errors requiring repetition of tests. Of more value still are his suggested short cuts and hints that save time and lead to a better solution.

Electrical World's Special Report Tells . . .

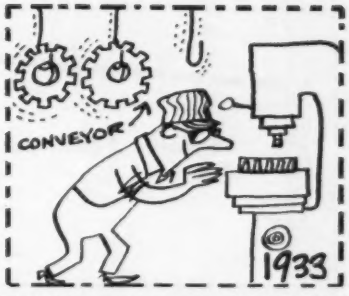
How Electricity Boosts Industrial Output

ALLEN LONG, Northeastern Editor

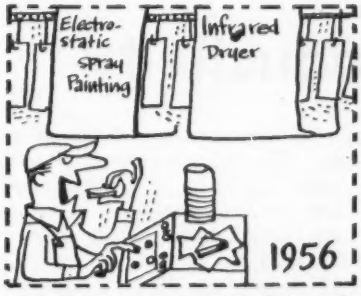


IN 1928, industry's manufacturing efficiency stood at a low index of 2.75 kwhr/man-hr

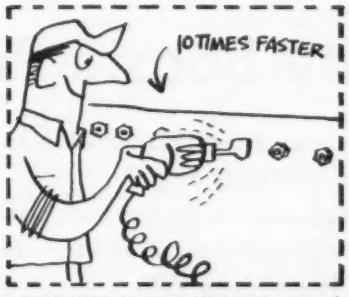
WITH THE CRASH OF '29, many firms went broke. Labor force dropped from 8.4 to 5.2 million. But . . .



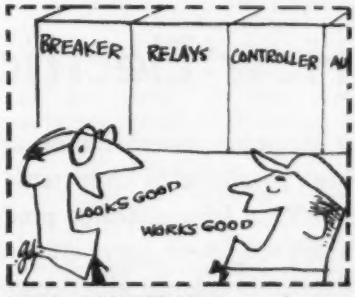
BY 1933, average use of power had hit 4.04 kwhr/man-hr, showing that surviving firms used more electricity



TODAY industry uses 9.7 kwhr/man-hr in efficient production. Trend is to 20 kwhr/man-hr by 1965



ELECTRICITY IS ECONOMICAL. Simple mechanized hand operations afford the greatest area for production savings



GOOD DISTRIBUTION in a plant enhances power's value. System should be simple, adequate, well maintained

Highlights of This Special Report

The following report is designed to spotlight two things: How electric power fosters productivity, and how electric utilities are helping manufacturers apply power profitably.

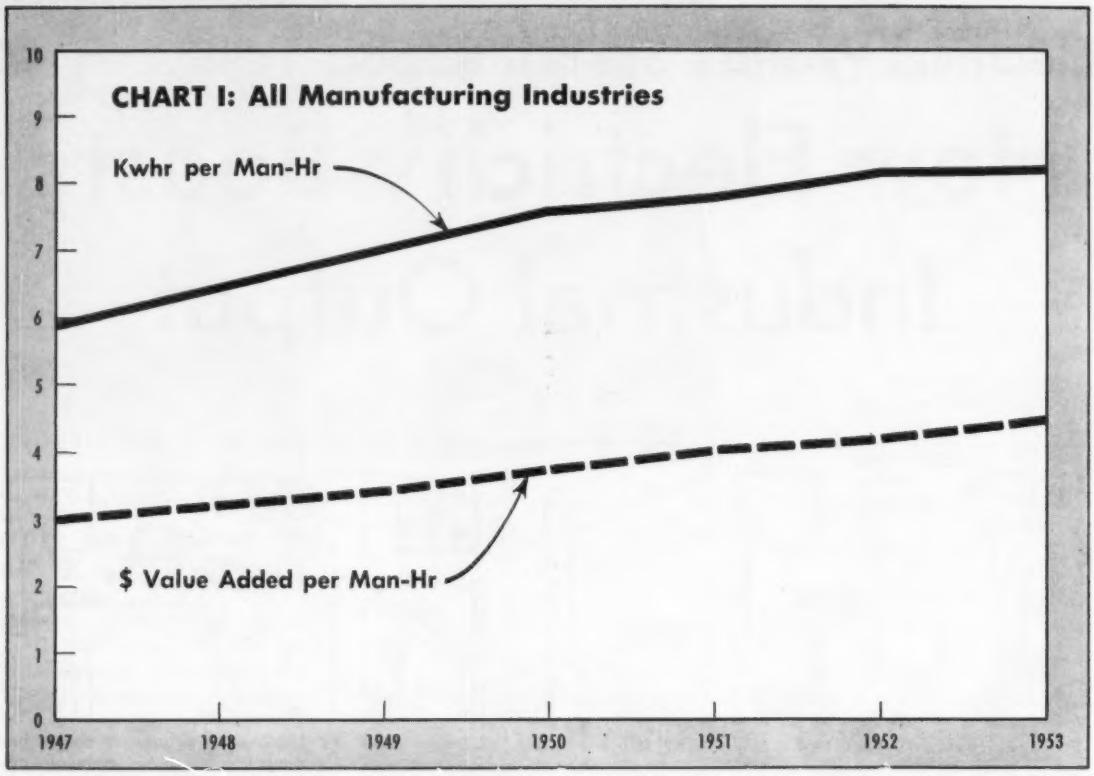
Electricity boosts productivity through efficient manufacturing. In the face of a predicted labor shortage, manufacturers will use more power through increased mechanization. Page 88.

Utilities have specially trained men to help manufacturers apply power effectively. These men and their qualifications are described on page 90.

Often called power salesmen, these men have been of great help to many manufacturers. A leather tanner tells here how a power salesman helped him. Page 92.

It is the power salesman's duty to recommend electrification of jobs that electricity can do best. A collection of such instances, with resulting benefits, is on page 94.

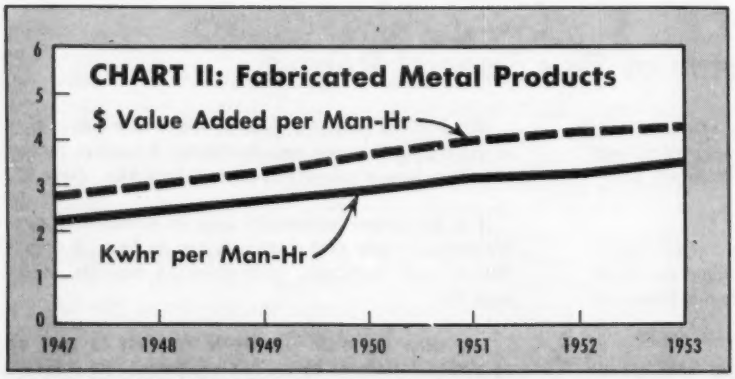
But often the manufacturer is the first to spot an operation performed by archaic equipment. He wonders what type of new equipment would be best. Points to consider in such a decision are listed on page 102.



VALUE ADDED PER MAN-HOUR FOR ALL INDUSTRY JUMPED 47% WHILE POWER USAGE CLIMBED 41% IN SAME PERIOD

How Electricity Boosts Productivity

- Increased manufacturing efficiency from 1947 to 1953 has been paralleled by an increase in electricity usage
- With a labor shortage predicted—and a shorter work week being sought—industry must speed mechanization to keep production in balance with demand for goods by 1975



PLANT DISTRIBUTION SYSTEMS should be built with the future in mind, for power usage in a plant often doubles every 15 years. Here it jumped 54% in 6 years

The overabundance of labor in the late '30's has disappeared. It may never return. In 1956 labor's supply and demand about balance, but we are facing a future scarcity of labor. To meet the demand for goods in 1975, industry will need 2 million workers it won't have unless it automates and mechanizes more rapidly than it has to date.*

This prediction is safely conservative. It assumes that our per-capita standard of living will continue to climb from 1955's figure of $2,300 to a 1975 figure of $3,900. But this prediction does not encompass labor's avowed goal of shrinking the work

*From "What Automation Means to America," published Sept. 1955 by Factory Management and Maintenance, a McGraw-Hill publication.

**"Value Added by Manufacture" measures the approximate value created in the process of manufacture. Value added is calculated by subtracting the cost of materials, supplies, containers, and fuel consumed, purchased electric energy, and contract work from the total value of shipments.

Industry Breakdown Contrasts Value Added with Power Used

Industry	$ Value Added per Man-Hour			Kilowatt Hours per Man-Hour		
	1947	1953	% Increase	1947	1953	% Increase
All Manufacturing Industries	3.05	4.49	47	6.00	8.44	41
Food & Kindred Products	3.82	5.52	45	4.28	5.74	34
Tobacco Manufactures	3.24	5.95	84	1.10	1.88	71
Textile Mill Products	2.32	2.59	12	4.35	6.32	45
Apparel & Related Products	2.45	2.72	11	0.47	0.97	106
Lumber & Products (except furniture)	2.00	2.82	41	1.89	4.02	113
Furniture & Fixtures	2.32	3.24	40	1.40	2.06	47
Paper & Allied Products	3.37	4.72	40	18.12	22.72	25
Printing & Publishing	4.80	6.41	34	1.45	3.31	128
Chemicals & Allied Products	5.50	8.50	55	20.21	27.94	38
Petroleum & Coal Products	5.70	7.97	40	18.57	26.91	45
Rubber Products	3.06	4.67	53	8.02	8.98	12
Leather & Leather Products	2.27	2.73	20	0.83	1.17	41
Stone, Clay & Glass Products	2.02	4.30	113	9.40	12.10	29
Primary Metals Industry	2.81	4.88	74	19.83	27.43	38
Fabricated Metal Products	2.81	4.33	54	2.31	3.56	54
Machinery (except electrical)	3.02	4.86	61	2.29	3.37	47
Electrical Machinery	3.02	4.62	53	2.80	3.56	27
Transportation Equipment	2.97	4.60	55	3.08	3.77	22
Instruments & Related Products	2.94	5.00	70	1.49	2.56	72
Miscellaneous Manufactures	2.57	3.87	51	1.37	2.04	49

week to 32 hours. By 1975 we'll be short 2 million workers even with our economy geared to a 40-hour week. On a 32-hour work week, we would lack 23 million workers.

Manufacturers now producing today at full capacity may well wonder how a growing labor shortage will affect their capacities to meet the demand for goods.

Mechanization is the answer. And mechanization means electrification.

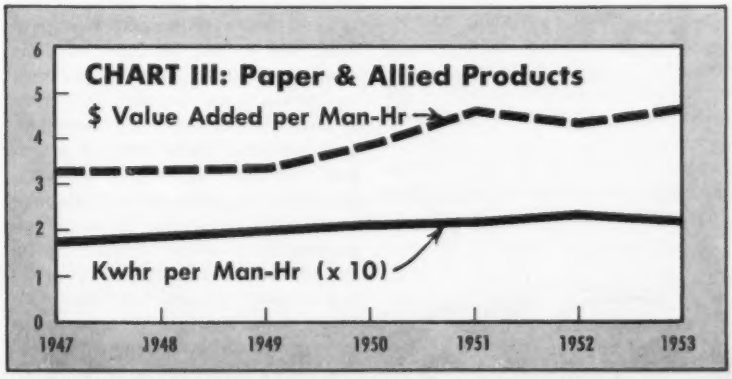
Through the medium of electrification, industrialists can boost production by supplementing labor with electricity. It has been said that a kilowatt equals the energy of 28 men.

A trend toward electrification already has appeared, as can be seen from Chart I. The lower curve shows how industry as a whole has improved its manufacturing efficiency. Since 1947 industry steadily has raised the dollar value added to products per man hour.** The upper curve shows how the growing use of electric power parallels this increase in manufacturing efficiency. So electric power will help manufacturers meet an incipient labor shortage.

Chart I, of course, is composed of many industrial segments. The segments generally follow the pattern, as can be seen from Charts II and III which are for two specific industries. But allowances must be made for individual industries because some production techniques lend themselves more readily to electrification.

The table on this page presents the growth of manufacturing efficiency in contrast to the growth in electric power usage. In the overall picture, manufacturing industries improved the dollar value added per man hour to products by 47% from 1947 to 1953. To do this requried an average increase of 41% in the number of kilowatt hours per man hour during the same period. The table shows these relationships for 20 specific industrial classifications listed in the U. S. Census of Manufactures.

To sum up: Industrial progress toward more use of electricity should be steady, and this will be paralleled by increased mechanization and electrification of production.



IMPROVEMENTS IN PRODUCTION processes help raise manufacturing efficiency too, but more use of electric power seems to go along with technical progress

How Power Salesmen Help

P. W. McCORMICK, Chairman, EEI General Power and Heating Committee, and Industrial Sales Manager, Union Electric Co of Missouri, St. Louis, Mo.

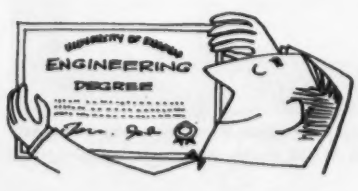
By its many commercial services and civic activities, today's electric utility is vitalizing the slogan "Live Better Electrically." In industry, this is being done by utility specialists who enjoy being of service to industry as well as to their own companies.

These men, usually found in the utility's Sales Department, are variously called power salesmen, industrial engineers, power service engineers, commercial representatives, or some other title. Let's simply call a man of this type the utility's "industrial representative."

It is this man who contacts the manufacturer, arranges for that new connection, explains power rates, coordinates services and trouble-shooting activities, discusses new ideas, and does a host of other things. In short, he is "the utility" to many of his customers.

These men have special qualifications for their jobs. First of all, the industrial representative is conscientious, sincere, honest, and loyal to his own company. He also gains personal satisfaction in helping his customers improve their operations so they may remain competitive.

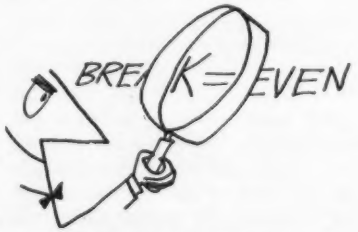
His next special qualification is his background. Usually he has dealt with the utility's industrial customers for years. Many (if not most) of the industrial representatives that utilities have added since World War II are engineering graduates. They may even be registered engineers.



OWNER (LEFT) AND LIGHTING SPECIALIST INSPECT NEW LIGHTS

The industrial representative is constantly adding to his education. He attends basic sales training courses to learn how to help his customers. He goes to meetings where equipment and products are discussed and where application techniques are described. He enrolls in study courses to expand his knowledge and to learn applications of business methods and production procedures. He seizes opportunities to attend conferences on the applications of electric heat, lighting, in-plant feeding, air conditioning, and the like. All of these things help provide him with the experience and knowledge he needs.

A further qualification is his interest in business. He knows that industry must remain productive to remain healthy. He knows that, with today's rising costs, the break-even point must be held under rigid control. Therefore production methods analysis is usually uppermost in his mind when he tackles a problem.



The industrial representative also has developed a fine set of ethics. He frequently has the chance to inspect industrial plants. He soon ac-

Industry Raise Plant Output

WITH UTILITY REPRESENTATIVE, PLANT SUPT, AND PLANT MGR

cumulates a wealth of knowledge about production problems and their solutions. He also quickly learns that many operations and processes are not to be discussed because of their competitive value. He knows that when he is shown things in a plant, he is shown them in trust. He respects this confidence.

All this training enables him to look for spots where manufacturing operations can be improved to the industrialist's advantage. Often his recommendations and suggestions pay off handsomely in savings to the manufacturer, such as more output per man-hour, fewer accidents, reduced costs, better employee morale, or more efficient use of space.

Of course, no industrial representative can know all the answers. Fortunately, however, he is backed by many experts in the utility whom he can call upon for help. Such experts might deal with lighting, boilers, distribution systems, insurance, or taxes.

Here's an example of how one of Union Electric's industrial representatives helped a manufacturer of lawn chairs who was having trouble getting the desired production from two plants. These plants were poorly lighted and had dark walls and ceilings. Machines were badly spaced, and work was trucked from machine to machine.

The industrial representative knew that the customer was planning to build a third plant. He discussed the advantages of good lighting and light-colored walls and ceilings. He talked about machine location and spacing, and the use of conveyors. He put the customer in touch with a conveyor representative who worked out the materials handling problem. (Industrial representatives are NOT consulting engineers.)

The utility lighting specialist was called in. Recommendations were made, and plans were drawn up after discussions with the architect and owner. In addition, the customer was put in contact with a paint representative who made recommendations.

The new plant, three times the size of the two old plants, was built. Conveyors were installed, the lighting plan was adopted, and painting was done as recommended. Results were good. The customer later said:

"With three times the floor space, we get five times the production with the same employees, and absenteeism has been cut to a bare minimum."

In another case, the utility representative called upon the isolated power plant specialist, company engineers, and statistical personnel to prepare a report involving a customer's power plant. The report showed that the customer could cut operating costs materially by shutting down his power plant and buying power from the utility instead.

Industrialists have a valuable ally in the utility industrial representative. He thrives upon opportunities to serve his customers. He will aid them any way he can—even at such a task as helping to find a suitable site for a new plant. You, his customer, can place confidence in him, for he already has earned the respect and personal friendship of many of his customers. He now awaits the opportunity to earn yours.

THE AUTHOR (left), F. J. Simek, and Power Salesman W. E. Borst examine one of the 12,000 skins that are custom-tanned at Independent Leather Corp

BORST (right) convinced Studenic that purchased power would be cheaper than power generated at the tannery and that it would eliminate problems of running a generator

How a Power Salesman Helped Me

ANTHONY STUDENIC, President, Independent Leather Manufacturing Co, Gloversville, N. Y.

In 1941 we started the Independent Leather Manufacturing Corp and bought a plant in Gloversville, N.Y. I have been president since then. Fred J. Simek is secretary-treasurer and general manager. During this time, we generated part of our power requirements and purchased the rest from Niagara Mohawk Power Corp and its predecessors.

Early in June 1954, W. E. Borst, one of Niagara Mohawk's power representatives, called my attention to the fact that our power requirements had reached a point where the load on our company-owned transformer bank of 300 Kva was 155% of bank rating. If this load was to continue, additional transformer capacity had to be provided at the earliest possible date.

We Needed New Transformers

It was agreed that this load would continue and, in fact, probably would increase another 25% to a total of 195% of bank rating.

Borst made a complete survey of our electrical system and presented recommendations involving a new transformer bank, bus-bar entrance with main breaker, distribution panel, and a 240-v capacitor bank with electrically operated air circuit breaker in a general-purpose enclosure for indoor mounting, to be located near and connected to the load side of the main breaker.

Also certain changes were recommended beyond the main distribution panel. These included the replacement of all internally operated disconnect switches and open fuse panels with externally operated switches and dead front fuse panels, plus the necessary rewiring.

I was convinced this would provide us with a fine system and without a doubt it was needed. However, an estimate as to the total cost (made by an outside party) was more than could be justified at that time. In fact, for a few thousand dollars more, I could buy a slightly used steam turbine and produce all my power requirements—an alternative which was given serious consideration.

Why Assume Headaches of the Power Business?

But Borst pointed out that all types of businesses have their own special headaches and the power business is no exception. I am a custom tanner with plenty of headaches; so why take on those of the power business? Our business is to tan skins, not produce power, and the power company's rates were based on mass production and sales which help keep down costs.

We agreed to the utility running a test with graphic charts on both sources of our power supply—that furnished by the utility and that generated by us. If it could be proved to our satisfaction that we could buy our power for no more than it cost to generate it, we could purchase a new transformer bank and make such other improvements as were necessary for the present; and we would discontinue generation.

The test ran six months, and the results convinced us that we were not interested in generating any of our power. We placed an order for a new bank of transformers which would provide us with a discount each month on our demand charge. We installed the bank in July 1955, bought the utility's two-pole primary structure, and installed a pole-top disconnect.

We Faced a Hot Water Shortage

We were now ready to shut down our generator but faced a shortage of hot water which was a by-product of running the steam engine. As we needed hot water during the time we normally ran the generator, it seemed logical to keep on generating as in the past. However, it was agreed that our hot water requirements had reached a point where we could not supply it at all times, even with the steam engine running. Meanwhile, Borst pointed out that the steam engine was using some of the heat from the steam to produce power. If this steam could be piped directly to the hot water boiler, more water could be heated.

This did not seem to be the answer as we already had a 2-in. line feeding the hot water boiler at boiler pressure (150 lb) with the engine shut down, and through a reducing valve at 5 lb pressure with the engine running. The exhaust steam from the engine at 5 lb pressure was run through a steam chest over a series of water coils cut in the water feed line to the hot water boiler. From here it fed through the heating coils in the hot water boiler. At times our hot water requirements are 500 gpm.

Now Production Is Up; Employees Are Happier

An outside concern recommended a $4,500 (plus installation cost) unit operated by steam which would produce hot water at 300 gpm. This didn't seem to solve our problem either, and finally we agreed upon piping more steam directly to the hot water boiler. This was done and now for the first time we have ample hot water. In fact, we can boil it now if we want to. This has increased our production, improved employee morale, and saved one man's time for something else as a result of shutting down the generator.

As a result of all this, we are now planning to step up our production. This will require the full steam output of the boiler to produce the hot water. It also will be necessary to buy an additional transformer bank and capacitors, install a bus-bar entrance, main distribution panel and disconnect switches, and enclose wiring to replace the present open wiring.

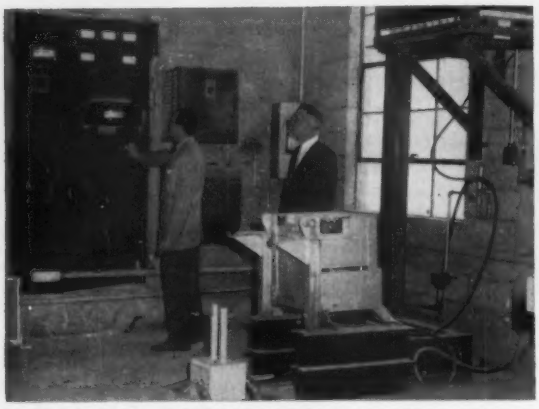
We'll Keep Old Generator for Stand-by Duty

We have enough problems related to increased production, and we have no desire to add to them by generating our own power, especially after discovering that we can buy it more cheaply than we can generate it.

Therefore our steam engine is being overhauled for use as a standby unit should there be a power failure. I might add, if my future experience with power failures is the same as the past, that there will be little, if any, need for this emergency generating equipment which can operate only a small percent of the plant in its proposed status.

How Power Salesmen Helped Others

This collection of case studies shows how power salesmen have helped many manufacturers meet diverse production problems with good electrical answers



ACCURATE HEAT CONTROL, obtained through an induction unit and an electric furnace, cut rejects of radar wave guides

HEAT TREATING FURNACE and its recording temperature control help caster to achieve accurate casting tolerances

Controlled Induction Heat Cuts Rejects of Intricate Castings

G. P. JONES, Power Sales Representative, Niagara Mohawk Power Corp, Syracuse, N. Y.

Sims Castings Corp, Syracuse, N. Y., makes precision castings for radar wave guides which require accuracy as great as ±.001 in. for some castings. Too many were rejected because temperature control of aluminum alloy No. 356 was not accurate enough. Porous spots resulted.

It was decided that induction heating would give more accurate heat control. Also to keep within the close tolerances required, a 25-kw heat treating furnace with a recording temperature control was installed. This furnace requires 3-phase, 230-v service.

A 40-hp, 3-phase, 230-v, 3,520 rpm induction motor-generator set with a 25-kva 1-phase, 230-v, 11,520-cps generator was installed to serve the induction melting unit. The m-g set was put in the machine room safely away from the dust of the molding room. A centrifugal table will be installed to insure that the metal will reach all corners of the intricate molds.

Flanges now can be properly machined and the results of this new installation have justified the expenditures.

Change in Heaters Solves Big Burn-Out Problem

[If your electric equipment does not perform satisfactorily, notify your power company. There may be an easy solution to the problem. Here's how a team of utility representatives helped a manufacturer save $600 a year—The Editor]

ARNOLD JACOBS, Industrial Engineer, Union Electric Co of Missouri, St. Louis, Mo.

During a routine call on the Maurer Supply Co, St. Louis, it was learned that the company was having trouble with an electrically heated vapor degreaser. A high burn-out rate on the immersion heaters made the degreaser unduly expensive to operate.

The industrial heating specialist was brought in to analyze the problem. After studying several burned-out elements and considering the customer's operating techniques, the probable trouble was determined. The type of element being used had such a high wattage density that it carbonized the oil dissolved in the cleaning solution. This build-up caused hot spots to develop and resulted in burn-outs.

It was recommended that a unit having a lower wattage density be substituted for the heaters being used. It also was recommended that the solution be cleaned more often and the liquid level watched more closely.

Prior to this investigation, an average of seven heaters a year were being replaced. Since the recommended changes were adopted two years ago, not a single heater has been replaced. This has resulted in an annual saving to the customer of about $600 in cost of heaters alone, not to mention savings in down-time and labor.

The customer is so satisfied with the results of these changes that he has abandoned plans for converting the degreaser to steam heat, even though process steam is available in his plant already.

New Distribution System Ends Motor Burnouts

In the business world a penny spent often means a penny earned. For instance, in 1951 a Southern plywood plant held tenaciously to its 230-v distribution system although it was so poor that motors were burning out. Feeders were too long, and the loads on the feeders' ends were too great.

Finally a large hog motor burned up because of low voltage. Plant production virtually stopped because of a waste disposal problem created by the emergency caused by this burnout.

A power salesman had three proposals ready. The first called for splitting the 230-v feeders and putting capacitors on some of the larger motors. But this meant moving the substation to a new spot, and it would have been a stop-gap remedy at best.

The second proposal involved splitting the load between two transformer stations and adding capacitors at strategic points. But this was considered "temporary" because the plywood plant was planning to expand. So this proposal was not recommended as the perfect solution.

The third proposal, which would meet future needs of the plant, meant switching from 230 v to 440 and adding capacitors to the load side of over-current devices on 20-hp motors or larger. This proposal was chosen and executed over a 6-month period to minimize downtime and to spread costs.

A new 13-kv/440-v substation was set in the approximate load center. The old substation carried the load during this construction. New entrance switchgear was put in at the new location, and the plant was changed over in sections during weekends to minimize interference with production. Power now is metered at 13 kv.

WORKMAN THROWS OIL SWITCH controlling lathe. Switch has capacitors beneath which hold voltage at right level

The plant's management did spend more money on motor reconnects, dry type transformers, motor controls, and switchgear than it would have if the old 230-v system had been retained. But now management has no electrical worries. It has been able to expand without further difficulty, and is now earning pennies it formerly lost during shutdowns.

Ceramic Kilns Melt Glass for Thick Stained Windows

To meet the requirements of temperature control and minimum space for equipment, the power salesman recommended electric ceramic kilns to the owner of a small shop that produces unique stained glass windows which are set in concrete.

Accurate temperature control and small size afforded by seven 220-v electric ceramic kilns help Roger Darricarrere make stained glass windows of singular character in his small shop in Los Angeles. The special kilns are side-opening furnaces with high-temperature elements suitable for operation at 1,800-2,000F. The electric kilns do not require an expensive system for temperature control. Kilns are about 3 ft high and 2 ft square. They take up minimum space, which is at a premium in the small shop.

Windows made by Darricarrere require tinted glass from 1 to 2 in. thick. With no source of this type of glass in the country, he produces his own glass in the colors and shapes needed. Seven kilns, ranging in size from 1.7 to 4 kw, are used in the melting and tinting of the glass. Total connected load is 26 kw. However, not more than four kilns have been operated at one time. Use of a particular kiln is determined by the quantity of glass required in a given color.

Annual revenue is estimated in excess of $14 per kw of total load. This is based on actual consumption for the first 30 days of operation.

ELECTRIC KILNS are used to melt and stain glass for unique windows 1 to 2 in. thick. Glass is otherwise unavailable

Acceptance of stained-glass windows set in concrete, plus satisfaction with the operation of electric kilns, has prompted Darricarrere to plan the addition of a 12-kw bell-type furnace for his shop. He has requested the utility's power salesman to design the heating element for this new unit.

Infrared Ups Bag Output; Keeps Employees Well

DUEL BETWEEN HEAT AND COLD is won by heat, using crossed infrared lamps at one pace. Result: increased output

B. MAURER, Commercial & Industrial Sales Representative, Arizona Public Service Co, Phoenix, Ariz.

The management of Arizona Bag Co, Phoenix, Ariz., has been concerned with a heating problem involving women who operate sewing machines. These women work in a large open building which ruled out the possibility of heating the general area. During cold weather their feet and legs became extremely cold. They spent considerable time moving about to keep warm. Far more important, they were losing time because of illnesses.

Because of the amount of lint that covers everything and hangs in the air, gas space heaters and resistance type electric heaters might have created a high fire hazard. After experimentation with 150-w infrared heat lamps, it was discovered that two bulbs placed on the floor could warm a person satisfactorily. By crossing the rays diagonally, it was found that the lamps not only warmed feet and legs but also warmed air which rose and kept the women warm.

Since infrared heat was installed, the women have not lost a day because of illness. Formerly two to five days were lost each week. Production has increased an estimated 25% during the colder hours.

As side advantages, these infrared lamps require practically no space, may be moved to new locations easily, and can be dismantled and packed quickly in their original containers for summer storage.

Heaters Thaw Earth, Stop Heaving of Floor

I. R. WEBRE, Industrial Representative, General Sales Dept, New Orleans Public Service, Inc., New Orleans, La.

The original design of a cold storage plant operated by Tropical Ice & Cold Storage Co, New Orleans, called for cooler rooms to operate between 33F and 36F. But as the plant expanded and the demand for frozen foods increased, it was necessary to convert the coolers to freezers operating at −22F.

In addition to more refrigeration capacity, the company added insulation to the walls and ceilings of these rooms. But because of the cost involved, no extra insulation was put under the floor.

Five years later, the earth beneath the floors froze and began to heave. During the next 3 years, this condition became so severe that it was difficult to handle produce in these rooms.

To restore the rooms to their original condition without interrupting operations, it was decided to use electric heat in the form of needles spaced on 10-ft centers driven through the floor into the frozen earth.

Made of a special alloy having a density of 10 w per sq in., the heating units were sheathed in brass casings. The units were connected to the power supply and operated continuously until the building, rooms, and piping settled to their original elevations. No heavy repairs were necessary.

After the worn surface of the floors was repaired, the units were wired permanently to automatic temperature

control power panels which maintain a normal ground temperature of 50 to 60F. Thermocouples in the ground under each room operate magnetic switches to maintain these predetermined ground temperatures. Thermocouples also were put underground to record maintained temperatures at various points.

Doors also froze frequently on these freezer rooms. They had to be pried loose and often this meant replacing the damaged door or framing. But 180-w lead-sheathed heating cables were imbedded in the door frame, and special door sills were installed. The cables automatically hold a temperautre of 36F at the points of contact. This practically eliminated frozen doors. The savings in lost time and a 60% reduction in maintenance and replacement of doors more than justified the expenditure.

Hot Water Pipe Licks Frozen Riser

W. P. ACKENDORF, Power Sales Representative, Niagara Mohawk Power Corp, Buffalo, N. Y.

Electric heat is keeping water from freezing in a tower riser supplying fire-fighting devices at Eastern States Farmers Exchange, Inc, Buffalo, N. Y. Although steam was available, electricity was chosen for economic reasons.

After fire insurance underwriters recommended that steps be taken to prevent a freezeup in the 150-ft riser, the utility power sales representative and a firm of consulting engineers attacked the problem to find the best solution. They chose an indirect hot water circulation system using electric circulation heaters as the primary heat source. The heaters supply hot water to a 2½-in. pipe inside the 3-ft riser. Hot water convects up this inside pipe and discharges into the tank. The hot water pipe is jacketed by a 4½-in. pipe, as shown in the diagram. The air space fosters even heat transfer.

Insurance regulations stipulate that the lowest allowable water temperature is 42F. In the Buffalo area the lowest average daily temperature was recorded at −10F in February of 1934. A table published by the National Board of Fire Underwriters revealed that 592,000 Btus would be lost each hour from the 100,000-gal tank at this average temperature. Dividing this heat loss by 3,412 Btu/kwhr showed that a total capacity of 173 kw would be needed to hold the water above 42F.

At this point the consultants had to decide whether to supply heat losses with the plant's existing steam system or with electricity. Either would require an 800-ft extension of facilities. A cost analysis was made which showed electricity the more economical:

Cost Analysis

	Steam	Electric	Saving
Installation Cost	$9,600	$7,560	21%
Operating Cost/Yr*	1,730	1,465	15%

* Includes depreciation and interest.

Maintenance costs were assumed to be equal for both systems but the simplicity of the electric system and the long life of the heating elements would tend to make the total operating cost favor electricity even more.

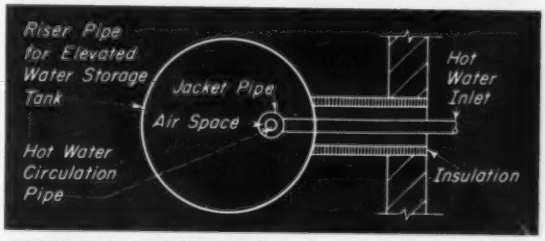
Thus electricity was chosen. As the usual mean winter temperatures in this area vary from 25 to 35F, and few severely cold days are experienced, it was recommended that one 75-kw and one 100-kw circulation heater be installed to minimize demand charges.

The elements of the 75-kw unit can provide either 25 kw or the full 75 kw. Temperature controls compare the outside temperature with the water temperature at the base of the discharge pipe. When water drops to 44F, the 25-kw element switches on. Below 40F, all 175 kw of heat is applied.

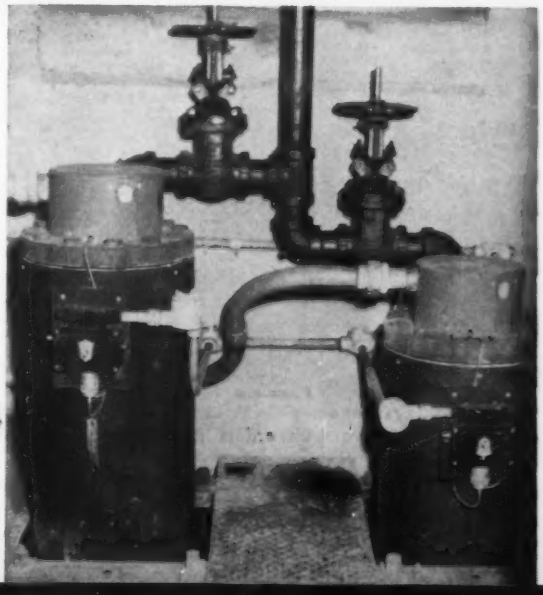
Water no longer freezes in the riser. The customer is benefitting from the system's simplicity, for there are no pressure or temperature gages to be tended by labor.

DESPITE AVAILABILITY OF STEAM, electric water heaters were chosen for this job because analysis showed them best

STANDPIPE RUNNING FROM WATER TOWER to fire-fighting devices in plant is kept from freezing by . . .



CIRCULATING HOT WATER through a small pipe inside the standpipe. Water empties into tower to warm stored water



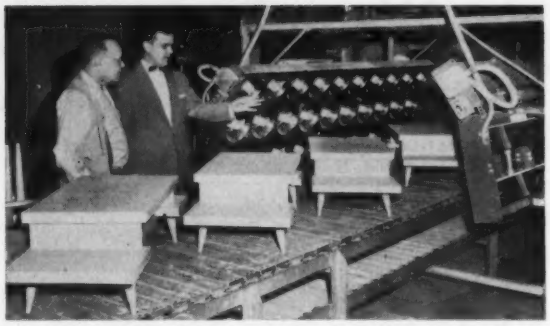
Infra Dries Furniture in 2 Min, Not 30

B. S. THOMPSON, Power Sales Engineer, Indianapolis Power & Light Co, Indianapolis, Ind.

One infrared oven has resolved a time and space problem for the Kramer Corp, Indianapolis, Ind., which found that it needed some way of drying furniture finishes faster and without devoting great floor areas to the process.

It was taking 30 min and a considerable amount of floor space to dry a full line of cocktail and occasional tables in this plant. The utility sales representative, however, suggested that an infrared oven be tried, and he explained the operation of this type of electric heat. He worked with the customer in evaluating the opinions of the oven's sales representative and the paint suppliers.

The customer bought one oven. It cut drying time from 30 min to 2. Furthermore the furniture is now handled less frequently; consequently the number of rejects has dropped. The customer has been so pleased that he now is experimenting with other possible applications of infrared to his manufacturing processes.



THIS INFRARED OVEN stepped up furniture-finish drying time from 30 min to 2, cut rejects, and freed floor space

OUTPUT WAS INCREASED 33% by this lighting layout which provides 50 to 60 ft-c along conveyor in shipping room

NEW LIGHT LEVEL enables clerks to price invoices immediately for enclosure with orders filled for pharmacists

New Lights Up Output 33%; Pay for Self in 6 Months

JOHN McVEY, Lighting Sales Representative, Niagara Mohawk Power Corp, Syracuse, N. Y.

To speed operations in the large stockroom of the division headquarters of McKesson & Robbins, Inc, wholesale drugs, at Syracuse, N. Y., recommendations were made for an improved lighting installation. This stockroom contains 96 aisles, each 24 ft long, with two shelving units having up to 42 sections of cataloged drugs and supplies which are ordered by retailers. These shelves are next to a continuous conveyor which carries to the shipping room bins filled with orders.

The lighting recommendations were acted upon by the company. Two-lamp, 8-ft fluorescent units were put over the conveyor to produce 50 to 60 ft-c. Three single-lamp, 8-ft fluorescent units were installed over the aisles to yield a minimum of 20 ft-c on the lowest shelves.

The improvement resulting from the installation has been noteworthy. Errors in compiling shipments have been reduced from 3.5 to 1.2 per thousand items. And with the same personnel, the company has stepped up shipments from an average of 2,400 items per day to 3,200 items—a 33% increase in output.

The new set-up enables clerks to price invoices as shipments are prepared. Price varies on each item with amount of the order and by content of drugs. Because of these variations, the recipient retailer appreciates having the invoice enclosed with the shipment so that he may know immediately what price to charge. With the improved lighting, contents and prices are easily distinguishable, and invoices can be priced immediately by the clerk.

The company is well satisfied with the installation and reports that it paid for itself in 6 months through more efficient operation, elimination of errors, increased production, and immediate billing.

Link Chain Conveyor Cuts Order-Filling Time 50%

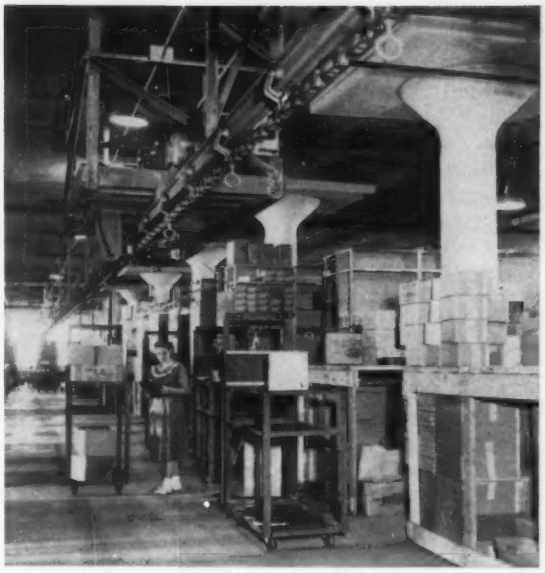
[Utility representatives build up a reservoir of knowledge through contacts with manufacturers. When no "trade secret" is involved, they can pass this knowledge on to others. Here's a case where a manufacturer created a slick conveyor to speed order-filling—The Editor]

LEON ALBERTSON, Market Studies and Service Division, Philadelphia Electric Co, Philadelphia, Pa.

A 1,000-ft-long link chain, driven by a 5-hp electric motor, snakes its way through aisles and around groups of bins filled with light hardware stock on the second floor of three combined buildings at Supplee-Biddle-Steltz Co, Philadelphia. Used in filling orders, the conveyor has helped cut 50% from the time previously required to make up an order, employees report. This includes routing, assembling, checking, packing, and chuting the order to a loading platform for delivery.

Trucks, single or in tandem, are selected to fill each order. They are hooked to the chain and towed to selected stations at 10 to 80 fpm. Some articles may be loaded on the truck while it moves by, but the truck may be unhooked and sidetracked momentarily until the article is added. Employees have found order-filling less fatiguing because articles often require less handling now than formerly.

Previously, trucks were pushed manually, and the articles were collected in canvas baskets. But the new system cuts damage to merchandise, maintenance to the canvas baskets, and repairs to other equipment. The only attention required by the new chain motor is an occasional oiling or greasing.



HOOKED TO RINGS on the overhead conveyor, these trucks move smoothly through the stockroom during order-filling

A further advantage of this conveyor system is that the trucks can be loaded with stock and routed to bins that need refilling. Safety during operation is assured by six switches conveniently placed at strategic spots. They enable employees to stop the conveyor at any time. The conveyor stops automatically if overloaded. A similar conveyor on the first floor uses larger trucks and carries heavier hardware items stored there.

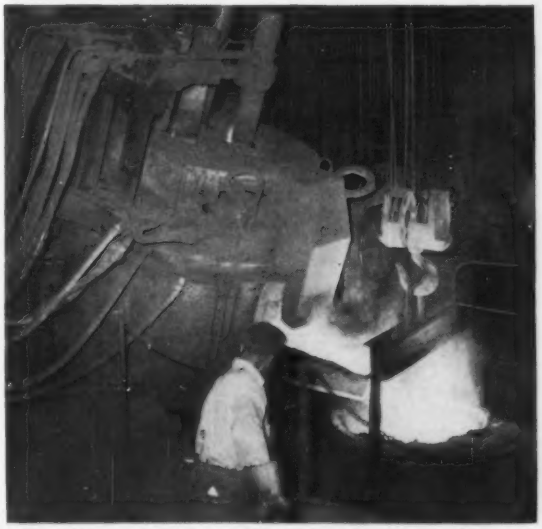
Automatic Furnace Control Pays for Self in 3 Months

W. F. DOHERTY, Industrial Engineer, Union Electric Co of Missouri, St. Louis, Mo.

St. Louis Steel Castings Co had been governing its overall plant demand by exercising manual control of its arc melting furnace. Recommendation was made to replace this manual control with automatic control through use of a demand regulator.

Several tests were made to determine control steps necessary to maintain pre-set overall plant demand. The installation was made. It paid for itself in less than 3 months from savings in electrical costs resulting from the maintenance of a higher plant load factor. Management can select the plant demand required to meet production requirements. Overshooting the desired demand, which results in higher demand charges, has been eliminated. The demand is utilized to the fullest extent as the tendency of the furnace operator to "play it safe" and estabilsh a lower demand is now no longer a factor.

Because the higher load factor resulting from this control, a time saving of about 10 to 15% is made in each heat. Estimated saving in electrical costs is $250 per month.



AUTOMATIC CONTROLS on this arc melting furnace enable a casting firm to save money by holding a high load factor

Excellent Lighting Design Sells Another Like It

J. J. FIORILLO, Sales Technical Representative, Con Edison, New York, N. Y.

A lighting level has been obtained at Bali Brassier Co, Inc, Long Island City, N. Y., of such excellence that sewing machines no longer need be equipped with special lights. Furthermore this installation sold another like it.

Prior to moving in a new 65,000-sq ft plant, the company decided to install the best lighting possible and began drawing up plans for the installation. Meanwhile Consolidated Edison offered to submit suggested lighting layouts complete with fixture specifications and recommended foot-candle levels.

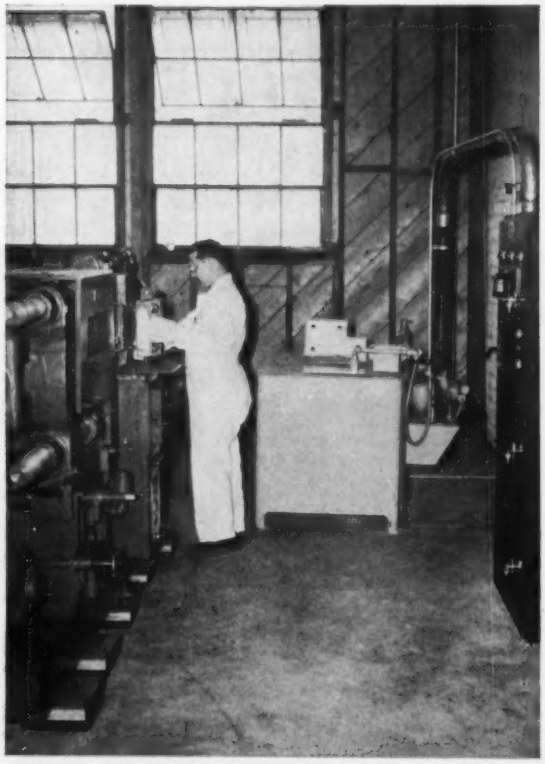
The company reviewed Con Edison's subsequent recommendations and made some modifications that seemed necessary from the manufacturer's point of view. Then company officials and Con Edison representatives examined the final plan critically to see that it conformed to good lighting practice. This plan then was accepted, and the installation was made.

Resulting illumination in the factory areas was 65 ft-c in comparison with the 45 ft-c level in the old Bali plant. This light level is supplied by two-lamp 96-in. direct industrial type fluorescent lamps operated at 430 ma.

The company later reported that the new lighting installation has resulted in better quality work, less operator fatigue, and fewer rejects. Moreover, few operators require supplementary lighting even when working black on black—which is a difficult seeing task.

The excellence of this lighting system appealed to representatives of a garter belt manufacturer who saw the 140-kw installation. Bali officials advised them to contact Con Edison and request a similar design for their plant, which they did.

THE VISITOR WAS SO IMPRESSED by the new lights that he immediately requested a similar layout for his own plant



INDUCTION FURNACE turns out brass for high quality die casting. Good working conditions make for greater output

Induction Heat Melts Brass for Precise Die Casting

An induction furnace was recommended by the power salesman to a company for its first entry into production of brass die castings. The customer was "sold" on the induction furnace after he visited a nearby installation with the power salesman.

Brass die castings of high quality and greater number are being produced with an induction furance installed by Thermac Co, Los Angeles. High quality castings are obtained through precise temperature control of molten brass temperature and elimination of hydrogen absorption. Die-cast brass also has a clean surface and good machining qualities.

Much lower ambient temperatures around the induction furnace permit the operator to maintain a high level of production. Depending on the size of the part to be cast, operators can turn out from 900 to 10,000 pieces an hour ready for finishing. This high production rate also prolongs the life of the costly die, which must be kept hot and working to reduce wear. (Cycles of heating and cooling shorten the life of a die.)

Thermac Co produces small brass castings for gas regulating devices. The company installed a 40-kw, 60-cycle, single-phase induction furnace in which the brass is melted within a narrow temperature band around 1,850F. Energy charges are about 20¢/100 lb of castings produced through use of this furnace.

Special Robot Was Made to Untie Production Knot

A. T. GAULKE, Industrial Engineer, Kansas City Power & Light Co, Kansas City, Mo.

Sometimes a power salesman must be a bit of an inventor. Here's a case where the Regal Plastic Co of Kansas City, Mo., wanted to increase production, cut rejects, simplify and speed up the handling of large sheets of plastic that the company vacuum formed. It was decided that a special machine had to be created to do this job.

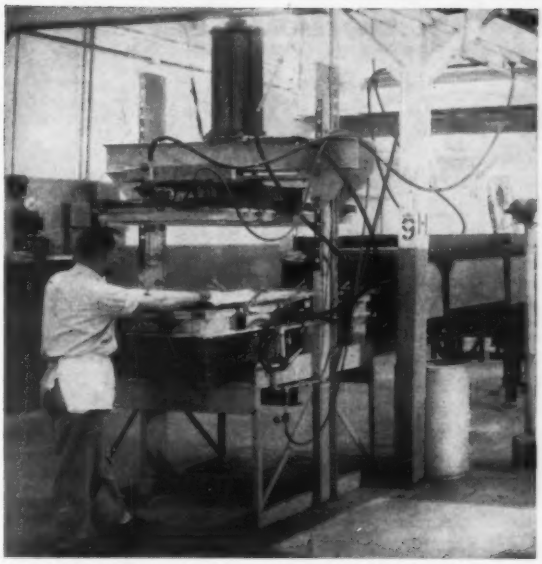
At that time, the plastic sheets were hung in a convection oven and heated between 310 and 400F, depending upon the type of plastic. Then they were put over the forming dies.

Through the efforts of Regal's own engineering staff, the local radiant heater representative, and Kansas City P&L's power sales engineers, an entirely new piece of equipment was conceived. It harnessed far-infrared to the plastic-heating job.

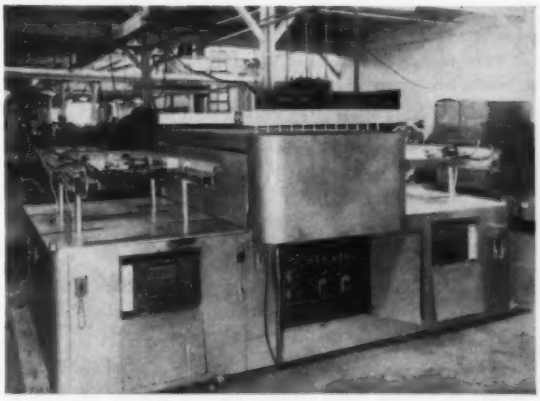
The original machine has a forming position on each end and a movable hood holding 21 1,800-w infrared units. This hood runs on a track and can be rolled over the plastic sheet and forming dies, or can be parked in a neutral position between dies. At the end of the heat-up time (varying from 30 to 60 sec), the heaters are rolled away and vacuum forming begins immediately.

Production now hits 300 sheets per 8-hr shift. Sometimes a day's output tops 1,000 units on a 3-shift basis. This contrasts strikingly with the prior production rate of 100 sheets per 8-hr shift.

An improved version of this machine soon evolved. It uses twelve 3,600-w infrared units. Both machines apply heat uniformly, avoiding hot spots in the plastic. Rapid softening is achieved easily by the intense radiation. Moreover, considerable amounts of floor space and labor are saved by performing all operations without moving the sheet. The machines are highly flexible as the distance from heater to work can be adjusted quickly.



THIS MACHINE resulted from company's decision to step up output. It uses 38.8 kw to soften and vacuum-form plastic



IMPROVED VERSION uses higher-wattage heaters and has a 43.5-kw demand. Output has tripled and space was saved

Ship Pier Gets Good Light; Men Work Safely at Night

EVEN A VAST AREA LIKE THIS PIER CAN BE WELL-LIGHTED

G. J. GILLEN, Sales Technical Representative, Con Edison, New York, N. Y.

The very nature of some locations makes it difficult to achieve good lighting. However good lighting can be obtained under adverse conditions—even those posed by the immense space of a huge ship pier where great volumes of cargo must be handled both day and night.

The Isthmian Line, which operates a 750 x 140-ft pier in New York harbor, obtained a high lighting level through the help of Consolidated Edison. The Line acted upon the utility's recommendations and reports that it now can use the pier at night with great safety to the men handling cargo.

Formerly this pier used bare 300-w bulbs. Now 750-w high-bay mirrored glass fixtures, mounted 28 ft above the floor, produce a 30-ft-c level inside, and 1,500-w enclosed floodlights produce 5 ft-c at the ship's side.

How to Evaluate Electricity for a Job

ARNOLD D. SPILLMAN,* Assistant Manager, Market Studies and Service Division, Philadelphia Electric Co, Philadelphia, Pa.

Every manufacturer at some time or another is faced with a specific problem requiring a decision as to whether the use of electricity is the best solution. Such problems arise again and again when he must replace old equipment or when he must add a new process to increase plant output. Here are a few points to keep in mind when you are confronted by these problems:

COMPARE INITIAL INVESTMENT you will have to make in the electric apparatus with the first cost of the alternate equipment. Remember to include installation expenses at this point.

EVALUATE THE RELATIVE SPACE needed by each type of equipment that could do the job for you. Plant space is valuable. Many manufacturers have added electric heat merely to quick-dry products that were taking up too much space while air-drying.

CONSIDER THE SPECIAL NATURE of the process, and the type of equipment needed to protect your employees. This might include, for instance, hoods and flues for removing exhaust gases, fumes, and the like.

LOOK FOR THE HIDDEN ADVANTAGES of using electricity. Inherent characteristics of electric heating equipment can work for you in three ways:

- By improving your plant's power factor. A heavy motor load, for instance, might tend to lower the plant power factor; whereas the addition of electric heating equipment would help to raise it. A power factor improvement could mean money in your pocket through better earned rates or by obviating power-factor corrective equipment.

- By improving your load factor. The added diversity of electrical demand often raises the plant's overall load factor and fosters more favorable overall average power rates for the user.

- By improving your incremental cost of electric service. The foregoing two points have a definite bearing on this. It is comparatively easy to establish your present base load requirements for light and power (your power company will help you do this), and it is relatively simple to superimpose the proposed electric heating load on this base load. The resulting figures will help establish your new incremental power cost, under the electric rate applicable, for the proposed load.

STUDY YOUR PRODUCT QUALITY in the light of goals you hope to achieve. Product quality is of increasing importance to industry, just as is the manufacturer's ability to produce more products at less cost. Product quality is related to production-line equipment that is dependable and accurately and easily controllable. Electricity is supplied under standard prescribed voltages, consequently heating operations can be performed precisely through controlled heat input. Furthermore duplication of high-quality results can be obtained easily, once the controls and proper heating cycles have been determined. This often frees labor and supervisors for other jobs.

ANALYZE YOUR PRODUCTION LINE to see how the alternate types of energy will fit into your production scheme. Electric power can be placed at almost any station selected. It accelerates production rates through push-button control. Electric equipment helps reduce labor costs per unit of product and to eliminate human errors. Such equipment is usually designed for severe duty and quick repairs. Controls are simple and reliable.

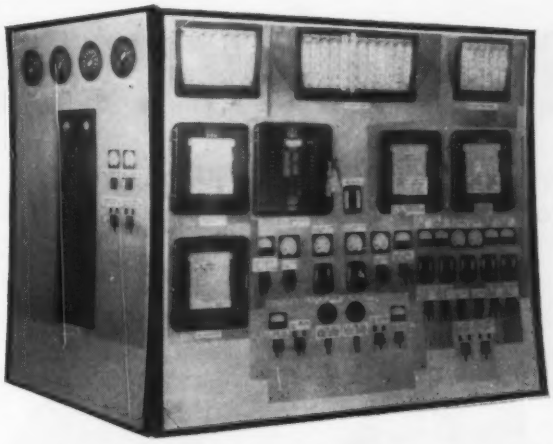
CONSIDER YOUR EMPLOYEES, for their comfort and morale are partial indexes to your production costs. The electric way to do a job often is the cooler and cleaner way. By raising employee morale, this may increase production and reduce absenteeism.

REMEMBER FUEL COST COMPARISONS must take into account many factors. Among these are availability, reliability of supply, rates, and rate trends.

REMEMBER IT'S A RARE PLANT that does not have a spot where electricity is potentially best. A fair appraisal of various operations often will disclose that the advantages of electricity will more than offset a fuel cost differential alone.

THEN DECIDE WHICH ENERGY IS BEST from your point of view. The answer you choose may not be best for a neighboring plant. Conversely, how the neighboring plant does a similar job may not be the proper way for you to do it, all factors considered. You can seek excellent help and guidance from the industrial representative of the electric utility serving your plant. He has a wealth of experience at his disposal. He deals with small and large, light and heavy manufacturing techniques daily. He will help you with your problems.

*Adapted from a paper presented at the Industrial Electrification Council's Industrial Electric Heating Conference, Cincinnati, Feb. 6-10, 1956.



MOCK-UP of control panels familiarized supervisors and operators with instruments and controls in the substation

ON-THE-JOB TRAINING was conducted during the startup of unit and served to prove the readiness of the operators

SUBSTATION—Operation

Train Operators for New Generating Unit

HAROLD GRASSE, Project Engineer, Black & Veatch, Kansas City, Mo.

To obtain maximum efficiency from a new boiler-turbine-generator unit in the Iowa Power and Light Co system men who were to operate the equipment were given a preparatory training course. Special operating instructions were prepared by the design engineers so that the trainees could learn to operate the equipment in accordance with its design.

Visual Aids Effective

Manufacturers' instruction books were sources of information for some instructions. But, as these books were primarily installation and maintenance manuals, much of their information did not fit into the operators' course, and they lacked system information essential to operational training.

Visual aids were used effectively in the advance stages of the training. Photographic positives of illustrations were mounted in frames and used with a transparency projector. They were projected on a 6-by-6-ft screen above and behind the instructor during class discussion. In this way attention of trainees was focused on the diagram as its details were explained by the instructor. Instructors also made freehand sketches large enough to be read by the trainees anywhere in the room.

For control room instruction, scale mock-ups of control panels were made. Pictures of actual panels were taken on the assembly floor at the manufacturer's plant and enlarged to approximately two-thirds actual panel size, mounted on insulated board and set up in the classroom. Even legend plates on the instruments could be read. These mock-ups familiarized operators with instruments on the panels.

Mock-ups Afford Practice

Panel mock-ups were used in simulating actual operation. Plant auxiliaries were put in service, fans started, the boiler purged, mills started, and the generator synchronized and loaded many times on the panel mock-ups before the fabricated control panels were actually delivered.

Inspection of equipment during assembly and erection was another phase of instruction. Supervisors inspected construction at frequent intervals, watching erection of the steam generator and assembly of the turbine. They examined auxiliaries, traced out piping and wiring systems, identified equipment and its relation to other equipment, and familiarized themselves with general arrangement of the plant.

Training Put to Test

Supervisors were given instruction first and, in turn, instructed the operators. This procedure helped to establish the authority and responsibility of supervisors.

Five weeks of classroom instruction were allocated for supervisors to study turbine, boiler, and electrical system operation. A nine-week period was scheduled for operators. These were followed by 13 weeks of "on-the-job" training during startup of the boiler-turbine-generator unit.

Two emergencies during the start-up period proved the efficacy of the instruction. A seasoned, experienced crew could not have handled them more skillfully.

(*More How To on page* 108)

DISTRIBUTION TRANSFORMERS

THIS CONNECTOR

COULD SAVE YOU...$60

Estimate your possible savings in terms of all transformers on your lines

It's an old story to many utilities—customer complaints about radio or TV interference. And it's an expensive story, too—at an average of $30 a service trip. In fact, it often takes a couple of calls—for a total of $60—before the real villain is revealed. That villain is "cold-flow"—the tendency of aluminum to yield causing loose connections. A little multiplication of the number of transformers on your lines will prove that "cold-flow" can be a costly nuisance.

G-E connectors save you those service trips. G-E connectors counteract "cold-flow" of aluminum conductors, give an extra-tight grip on copper conductors. Low-voltage bushings have two coned-disk stainless steel washers which automatically maintain high pressure. High-voltage, tank-wall bushings achieve the same result with an internal, stainless steel follow-up spring.

Even if you don't use aluminum conductor, you still want assurance of tight connections. The new G-E connectors can save costly service calls.

Look at the other money-saving features offered by G-E distribution transformers: **Impulse testing** saves years of transformer life. **One-piece clamping bands** save maintenance time. Reusable **Nitrile rubber gaskets** help save units from contamination. **Strenicor terminal clamps** save terminals from breaking. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431-39, Schenectady 5, New York.

dollar-saving features prove ATANA*

***ALL TRANSFORMERS ARE NOT ALIKE**
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

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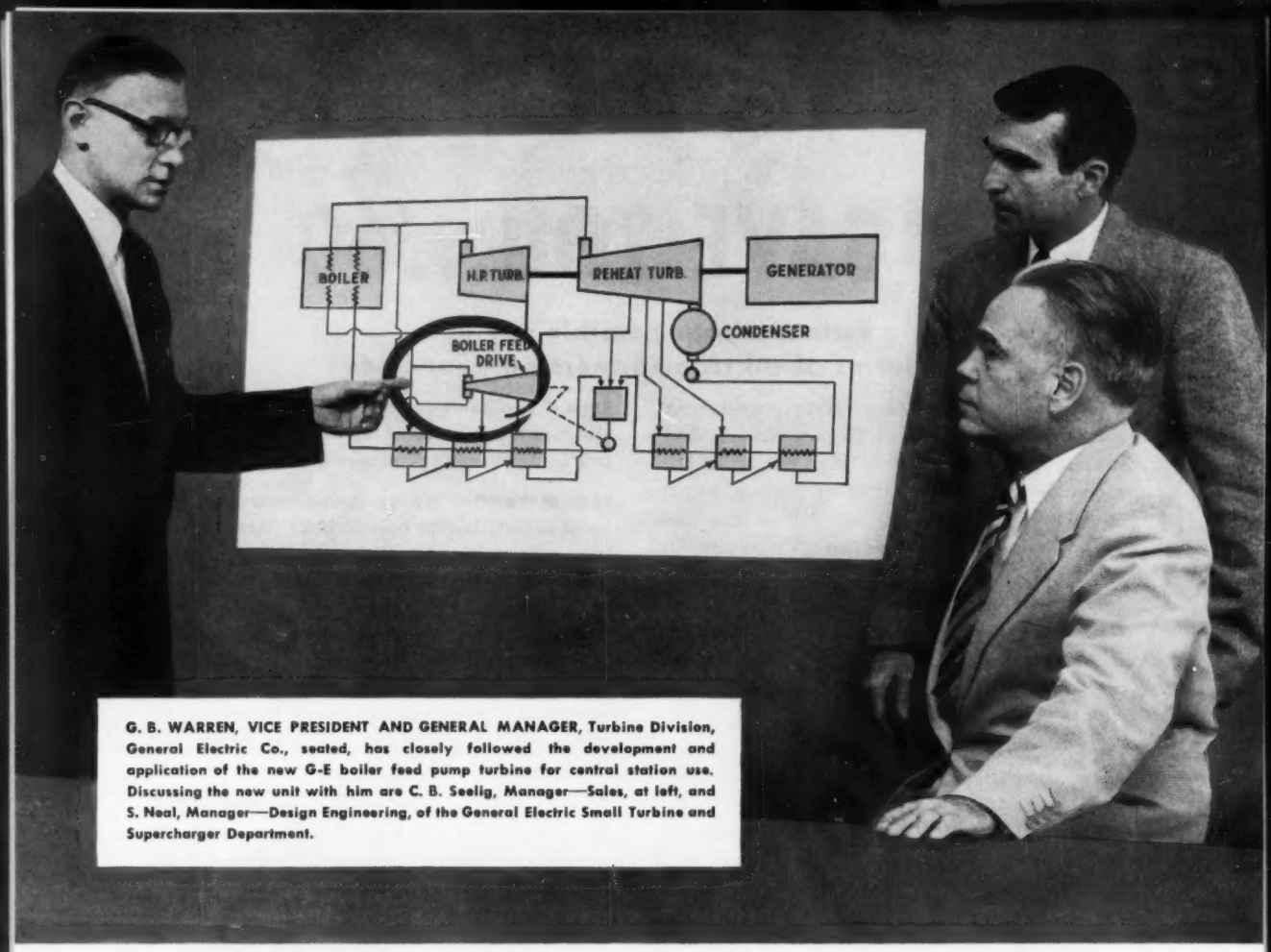
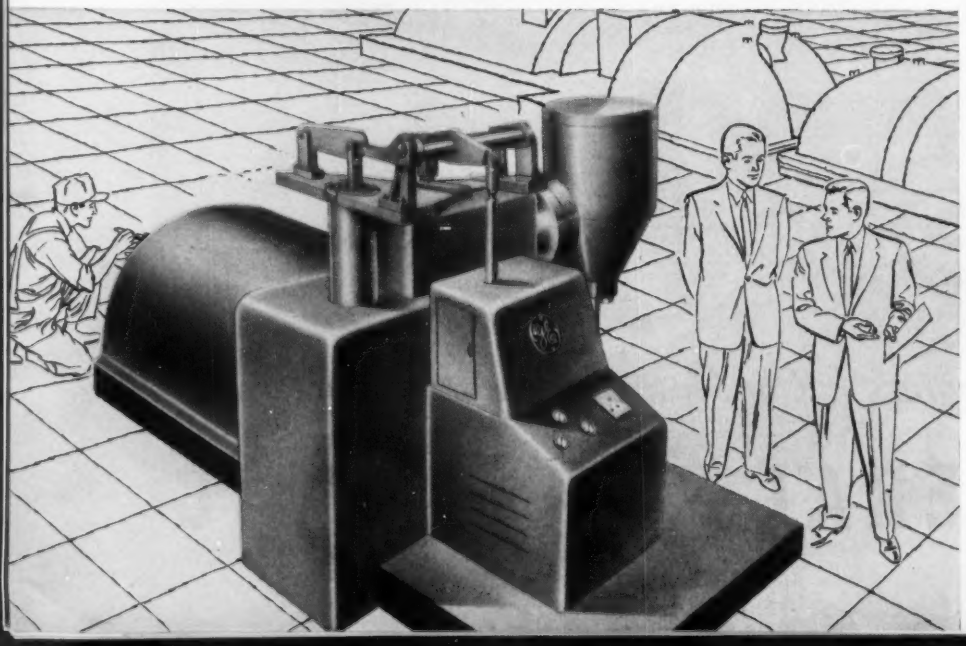
GENERAL ELECTRIC



G. B. WARREN, VICE PRESIDENT AND GENERAL MANAGER, Turbine Division, General Electric Co., seated, has closely followed the development and application of the new G-E boiler feed pump turbine for central station use. Discussing the new unit with him are C. B. Seelig, Manager—Sales, at left, and S. Neal, Manager—Design Engineering, of the General Electric Small Turbine and Supercharger Department.

FOR THIS PARTICULAR APPLICATION ARRANGEMENT the high-speed turbine taps steam from the cold reheat line and exhausts to the heating system of the main turbine. By directing the exhaust from the boiler feed pump drive turbine to the main feed-water heating cycle, good plant heat rates are achieved under normal loading conditions. Since the reheater flow is reduced, savings may be achieved in reheat piping. During start up and light load operation, steam from the main boiler is admitted through auxiliary valving to the boiler feed pump turbine.



THIS TURBINE CAN INCREASE YOUR NET SALABLE KILOWATTS. It is one of a new line of General Electric turbines for driving boiler feed pumps in the 4000- to 10,000-hp range at speeds up to 9000 rpm.

HIGH-SPEED TURBINES

Announcing...

The NEW General Electric High-speed Turbine for Boiler Feed Pumps

GENERAL ELECTRIC has developed **a new turbine** especially designed to drive boiler feed pumps. This is the result of a thorough study which proved that such a turbine can bring significant advantages to electric utilities.

Because of today's trend toward increasingly higher pressures in high-output steam-electric generating plants, General Electric feels that mechanical-drive turbines can now be economically justified as boiler feed pump drives. Feed pumps for such plants now require 5000 to 10,000 hp at high speeds.

THE VARIABLE-SPEED CHARACTERISTICS of turbines are also particularly adapted to boiler feed pump control. This new concept in power station engineering is practical from both an operational and economical standpoint.

HERE IS HOW STEAM STATIONS CAN PROFIT using these new G-E turbines: Auxiliary power normally supplied by the main generator for motor-driven feed pump drives can now be released as salable kilowatts. This increase in salable power is available at relatively little incremental investment.

This design, the latest addition to General Electric's complete line of high-speed turbines, is built for easy operation and highly reliable service. Several utilities have already purchased a number of these units.

THE SCHEMATIC DIAGRAM shows one way in which G-E boiler feed pump turbines can fit into a typical steam station system. For additional information on how these turbines can be applied in your specific plant, contact your nearest G-E Apparatus Sales Office or write General Electric Company, Small Turbine and Supercharger Department, Fitchburg, Mass. 241-4

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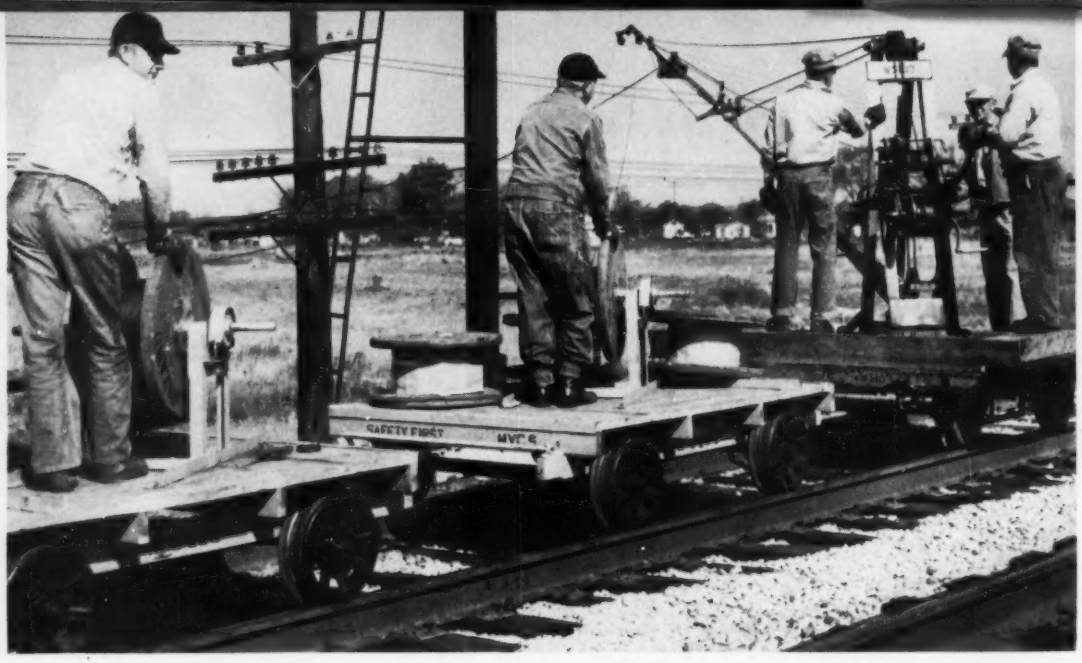


DISTRIBUTION—Construction

Rigging Strings Wire at Rate Up to 9 Mph

. . . Saves railroad $50,000, and appears to one utility to be adaptable to its uses

A mechanical wire-stringing rigging on its first formal field test recently strung two lines of No. 8 copper-coated wire, working 3 hr per day, the 190-mile distance between Cleveland, Ohio, and Buffalo, N. Y., for the New York Central Railroad. Savings to the railroad were about $50,000.

Lyle Jackson, superintendent of the Central's Erie division, is owner of the patents, and the machine was developed by Quint Gravatt & Co, Cleveland. The machine consists of a hoist and telescopic beam which can be fitted on any type of work vehicle.

Boom Extends 67 Ft

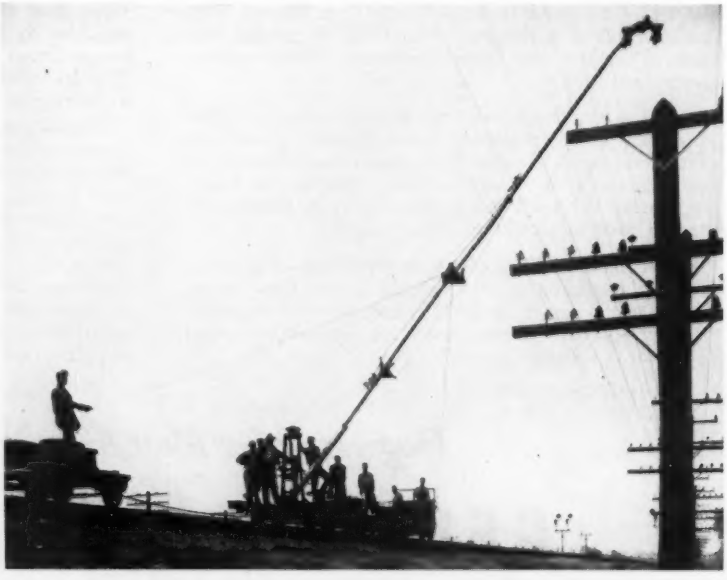
The boom of three 20-ft tubes can be extended to 52 ft, and the addition of a 15-ft jib gives a 67-ft boom for normal operations. The jib is bolted to the end of the main boom. At the end of the boom is a four-way action feeding head which aligns the wire to follow the pole line.

Adaptable to Wire Size

Wire feeds from two reels on the hoist mechanism at the rate of 3 to 9 miles per hr, maintaining the desired tension on the line at all times. Linemen follow closely to tie in the strung wire to the insulators. The boom is completely insulated.

The machine can be made to string any size wire at about the same speed, but there are some spots along lines which, according to Gravatt, cannot be reached.

The machine costs about $3,500 mounted on the user's equipment, and one electric utility has submitted an order.



DISTRIBUTION—Operation

Special Connector Replaces Protector's Wiping Sleeve

W. R. DONALD, Engineer, Public Service Electric & Gas Co, Newark, N. J.

M. R. MONASHKIN, Associate Technical Service Engineer, Burndy Engineering Co, Norwalk, Conn.

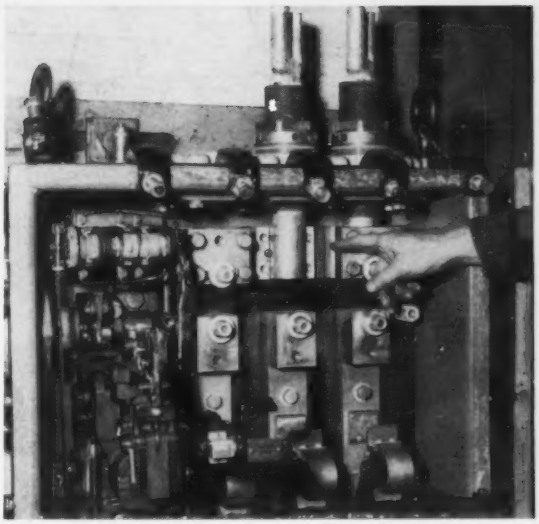
A mechanical, compression type connector is used by Public Service Electric & Gas Co of New Jersey to replace wiping sleeves on underground network protectors. It adapts the protector for connecting two 500-MCM, paralleled, neoprene-covered cables instead of one, 1,000-MCM, rubber-covered lead-sheath cable. For several years the connectors have performed well.

The earlier cable connection required time to make, involving a solder-wiped joint. This made reliability a function of the skill and care of the splicer. As time went on, the utility took the protectors out for repair. When re-installing them, the company desired to use two 500-MCM neoprene jacketed connectors instead of the 1,000-MCM, lead-covered cable.

This multiple connector consists of a two-way piloted casting to which pre-determined sizes of copper tubing have been brazed to accommodate the network cables on one end and provide a smooth stud for insertion into the network protector clamp on the other. The connector body is covered with a special rubber compound sleeve to provide the necessary insulation and make the connector water tight. The rubber sleeve is coated with rubber cement at the area that forms a seal.

A special rubber gasket and brass washer are pre-assembled. The standard type spanner compression nut, used to form the seal in the original connection, is re-employed to compress the gasket and make the seal. The connectors are lined up to insure adequate clearance for the hydraulic press-type cable installation tool, and the spanner nut is tightened. New network cables are then installed. The connections are waterproofed by several layers of rubber or plastic filler tape, covered with a layer of pressure sensitive vinyl tape.

The connector seal was subjected to 50 psi for 10 min without leakage. The connectors have performed well in service in submersible areas for several years.



CONNECTOR'S TUBING replaces the sweat thimbles that were originally installed on cable in network protector

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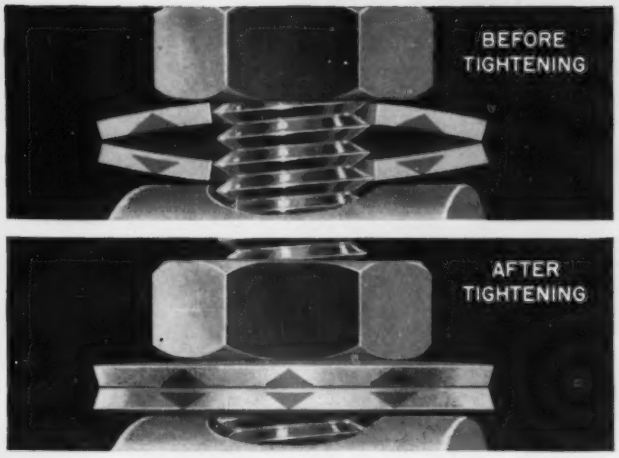
SAFETY

Cars Get Safety Belts

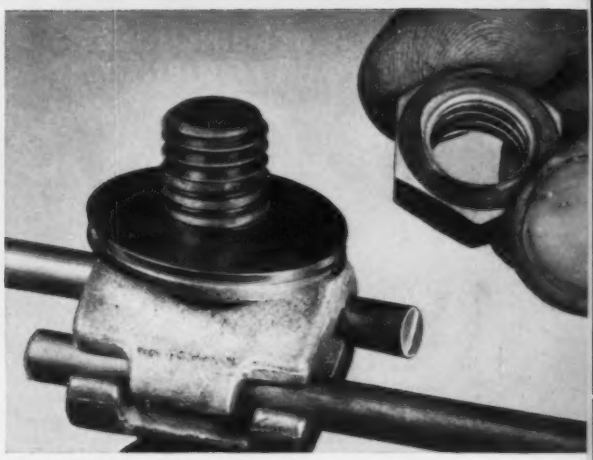
Toledo Edison Co has equipped 40 passenger cars and plans to equip all of them with safety belts. This decision was based on recommendations of the National Safety Council, backed up by subsequent recommendations by police organizations in several states and endorsements of insurance underwriters. An accident involving an employee hastened the decision. The seat belt fastens to the car door and helps prevent the door from flying open in a crash.

(*More How To on page* 118)

DEMONSTRATION OF CLAMPING ACTION of G-E Capacitor Terminals shows how Belleville washers flatten after proper wrench torque—maintain 1000-lb pressure. Aluminum and/or copper conductors are held securely even if "cold flow" should occur.



1000-LB SPRING ACTION through compression of Belleville washers. Flattened washers indicate sufficient torque.



STUD STRIPPING ENDED with easy-to-replace nut which strips first if too much torque is applied.

G-E CAPACITOR TERMINALS MAINTAIN LASTING CONTACT

Field-proven assembly compensates for "cold-flow" and eliminates terminal stud stripping

Quick, lasting connections can be made with G.E.'s capacitor terminal assembly. Linemen need only *flatten* the stainless steel Belleville washers with about 2 turns on the nut to securely clamp aluminum or copper conductors. That's because these washers convert 8 ft-lbs of torque to approximately 1000 lbs force on the parallel groove connectors. They also provide a "follow-up" action that compensates for aluminum "cold-flow," thereby maintaining lasting contact pressure.

STRONGEST ASSEMBLY on the market today, the G-E capacitor terminal stud has been subjected to tightening torques of over 70 ft-lbs without damage. If excess torque is applied, the threads on the nut, which has been designed as the weakest member of the assembly, will strip before those on the stud.

WIDE RANGE OF CONDUCTORS (AL/CU) from No. 2 to No. 9 AWG (stranded) or No. 10 AWG (solid), can be securely clamped with G.E.'s parallel groove connector. A conductor can be easily inserted without threading or removing any hardware.

ENGINEERED EXTRAS such as this new terminal combine to make General Electric capacitors the most practical . . . and economical unit for you. For complete information about them, contact your G-E Apparatus Sales Representative or write for bulletin GEA-6260, General Electric Company, Schenectady 5, New York. 441-28

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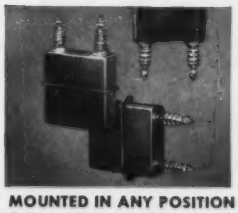
ONLY G-E CAPACITORS HAVE ALL THESE *Engineered Extras* AT NO EXTRA COST



MOUNTED IN ANY POSITION G-E capacitors maintain uniformly high efficiency.

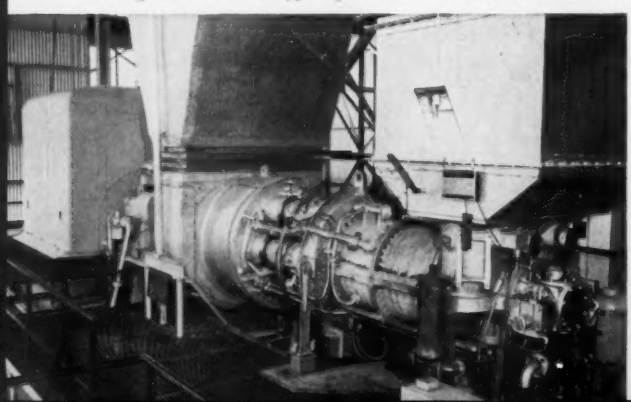
CORROSION-RESISTANT CASE, tin plated inside and outside, prolongs capacitor life.

SMALLER AND LIGHTER, than any other make, for easiest handling and installation.

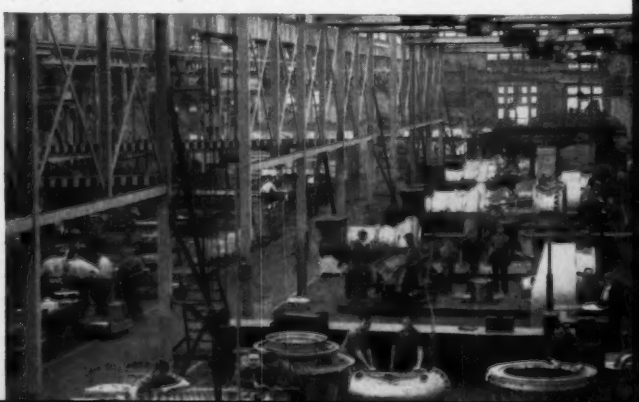
EXTRA-STRENGTH BUSHINGS, welded then soldered to case, maintain hermetic seal.

TURBINE COMBINATIONS FOR TOP EFFICIENCY

EXAMPLE OF GAS TURBINE used in a combined gas turbine-steam turbine cycle is shown below installed at a Southwestern utility. Use of gas turbine exhaust for feed-water heating resulted in 15% improvement in station heat rate.



GENERAL ELECTRIC GAS TURBINE PLANT shown below is devoted exclusively to the development and manufacture of commercial gas turbines. General Electric gas turbines have over 1,000,000 hours of operation to their credit—a world's record.



STATION EFFICIENCY GOES UP when this G-E gas turbine-steam turbine team goes into action. Here, exhaust gas from gas turbine is used as highly preheated combustion air for steam boilers. Result is 5% improvement in system efficiency.

NEW WAY TO IMPROVE HEAT RATE:

G-E gas turbine exhaust used as boiler combustion air

Significant improvements in station heat rate can be realized by adding a General Electric gas turbine to a steam-turbine power plant cycle. By utilizing the gas turbine exhaust in the over-all cycle, the efficiency of the combined plant becomes higher than could be attained by either unit operating separately.

IN THE EXAMPLE AT LEFT, station capacity is increased with a gas turbine driving a generator in parallel with the main steam turbine-generator. Exhaust from the gas turbine, which retains 80% of its original oxygen, is used as highly preheated combustion air for a fuel-fired steam boiler. Since a major portion of the heat energy in the gas turbine exhaust is recovered in the boiler, less boiler fuel is required and the higher preheat temperature promotes more efficient combustion. Result: a higher over-all thermal efficiency and resultant improvement in heat rate.

A 5000-KW G-E GAS TURBINE, for example, provides all the combustion air required for a boiler supplying 1250 psig, 950 F steam to a 40,000 kw condensing steam turbine. A recent study shows that net heat rate for such a plant would be 9975 Btu/kwh as compared to 10,500 Btu/kwh for a steam plant without a gas turbine. This represents a 5% improvement in heat rate.

IN DOLLARS AND CENTS, this application of a gas turbine to a steam-turbine cycle offers a saving of about $46,000 per year (based on 77% plant factor, 15% gross fixed charges, and 30¢ per million Btu for fuel).

SIMILAR ECONOMIES are obtainable with other gas turbine-steam turbine cycles. Your G-E Apparatus Sales Representative can give you further details on the combination that offers maximum savings to your particular installation. Or write to General Electric Company, Section 261-5, Schenectady, 5, New York.

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Square Copper Bus Tubes: Dimensions, Properties, Ratings

Data apply to square hard-drawn copper bus tubes. Material is adapted from a book on electrical conductors to be issued by The American Brass Co

Nominal Size, In.	Outside Dimensions, In.			Wall Thickness, In.	Nominal Weight, Lb. per Foot	Cross-Sectional Area of Copper		Moment of Inertia, In.⁴	Section Modulus, In.³	Radius of Gyration, In.	D-C Resistance, Microhms per Foot (a) at 20 C 68 F	Skin-Effect Ratio (b)	60-Cycle Current Rating, Amperes (c)
	Square	Diagonal	Corner Radius			Sq. In.	Thousand Cir. Mils						
3 x 1/8	3.00	3.932	0.375	0.125	5.31	1.370	1745.	1.835	1.223	1.157	6.10	1.02	1660
3 x 3/16	3.00	3.932	0.375	0.1875	7.83	2.019	2570.	2.599	1.733	1.135	4.14	1.04	1990
3 x 1/4	3.00	3.932	0.375	0.250	10.24	2.643	3365.	3.272	2.181	1.113	3.15	1.07	2250
3 x 5/16	3.00	3.828	0.500	0.3125	12.31	3.175	4042.	3.723	2.482	1.083	2.62	1.12	2420
3 x 3/8	3.00	3.828	0.500	0.375	14.48	3.736	4757.	4.215	2.810	1.062	2.23	1.19	2540
3 x 1/2	3.00	3.621	0.750	0.500	17.72	4.571	5820.	4.598	3.065	1.003	1.82	1.38	2640
4 x 1/8	4.00	5.243	0.500	0.125	7.15	1.844	2347.	4.475	2.237	1.558	4.54	1.03	2140
4 x 3/16	4.00	5.243	0.500	0.1875	10.58	2.729	3474.	6.431	3.216	1.535	3.06	1.05	2570
4 x 1/4	4.00	5.243	0.500	0.250	13.91	3.589	4570.	8.215	4.108	1.513	2.32	1.09	2900
4 x 5/16	4.00	5.243	0.500	0.3125	17.15	4.425	5634.	9.836	4.918	1.491	1.88	1.15	3140
4 x 3/8	4.00	5.243	0.500	0.375	20.30	5.236	6667.	11.30	5.652	1.469	1.59	1.23	3300
4 x 1/2	4.00	5.036	0.750	0.500	25.47	6.571	8366.	13.06	6.532	1.410	1.27	1.46	3420
5 x 1/8	5.00	6.450	0.750	0.125	8.88	2.290	2916.	8.705	3.482	1.950	3.65	1.03	2610
5 x 3/16	5.00	6.450	0.750	0.1875	13.17	3.398	4327.	12.62	5.048	1.927	2.46	1.07	3130
5 x 1/4	5.00	6.450	0.750	0.250	17.37	4.482	5706.	16.26	6.503	1.905	1.86	1.11	3520
5 x 5/16	5.00	6.450	0.750	0.3125	21.48	5.541	7055.	19.64	7.854	1.882	1.50	1.17	3810
5 x 3/8	5.00	6.450	0.750	0.375	25.49	6.575	8372.	22.76	9.105	1.861	1.27	1.25	4010
5 x 1/2	5.00	6.450	0.750	0.500	33.22	8.571	10910.	28.32	11.33	1.818	0.97	1.51	4180
6 x 1/8	6.00	7.864	0.750	0.125	10.81	2.790	3552.	15.54	5.179	2.360	3.00	1.05	3070
6 x 3/16	6.00	7.864	0.750	0.1875	16.08	4.148	5282.	22.65	7.551	2.337	2.02	1.08	3670
6 x 1/4	6.00	7.864	0.750	0.250	21.25	5.482	6980.	29.36	9.786	2.314	1.52	1.12	4160
6 x 5/16	6.00	7.864	0.750	0.3125	26.32	6.791	8646.	35.66	11.89	2.292	1.23	1.20	4480
6 x 3/8	6.00	7.864	0.750	0.375	31.30	8.075	10280.	41.59	13.86	2.269	1.03	1.28	4720
6 x 1/2	6.00	7.864	0.750	0.500	40.97	10.57	13460.	52.35	17.45	2.225	0.79	1.54	4930
7 x 3/16	7.00	9.278	0.750	0.1875	18.99	4.898	6236.	36.94	10.55	2.746	1.69	1.10	4230
7 x 1/4	7.00	9.278	0.750	0.250	25.12	6.482	8253.	48.07	13.73	2.723	1.28	1.15	4760
7 x 5/16	7.00	9.278	0.750	0.3125	31.17	8.041	10240.	58.64	16.76	2.701	1.03	1.22	5140
7 x 3/8	7.00	9.278	0.750	0.375	37.11	9.575	12190.	68.67	19.62	2.678	0.86	1.31	5420
7 x 1/2	7.00	9.278	0.750	0.500	48.72	12.57	16010.	87.18	24.91	2.633	0.66	1.57	5680
8 x 3/16	8.00	10.69	0.750	0.1875	21.89	5.648	7191.	56.23	14.06	3.155	1.47	1.11	4760
8 x 1/4	8.00	10.69	0.750	0.250	29.00	7.482	9526.	73.40	18.35	3.132	1.11	1.17	5350
8 x 5/16	8.00	10.69	0.750	0.3125	36.01	9.291	11830.	89.82	22.46	3.109	0.89	1.24	5790
8 x 3/8	8.00	10.69	0.750	0.375	42.93	11.08	14100.	105.5	26.38	3.087	0.75	1.33	6110
8 x 1/2	8.00	10.69	0.750	0.500	56.48	14.57	18550.	134.8	33.70	3.041	0.57	1.59	6400

NOTES: Variations from these values must be expected in practice. ASTM Specification B 188, Seamless Copper Bus Pipe and Tube, controls the tensile properties, conductivity, tests and inspection. Dimensional tolerances are agreed between manufacturer and purchaser at the time of placing an order.

(a) Dc resistivity. The resistances are based on the ASTM Specification B 188. The conductivities of square tubes according to size are:

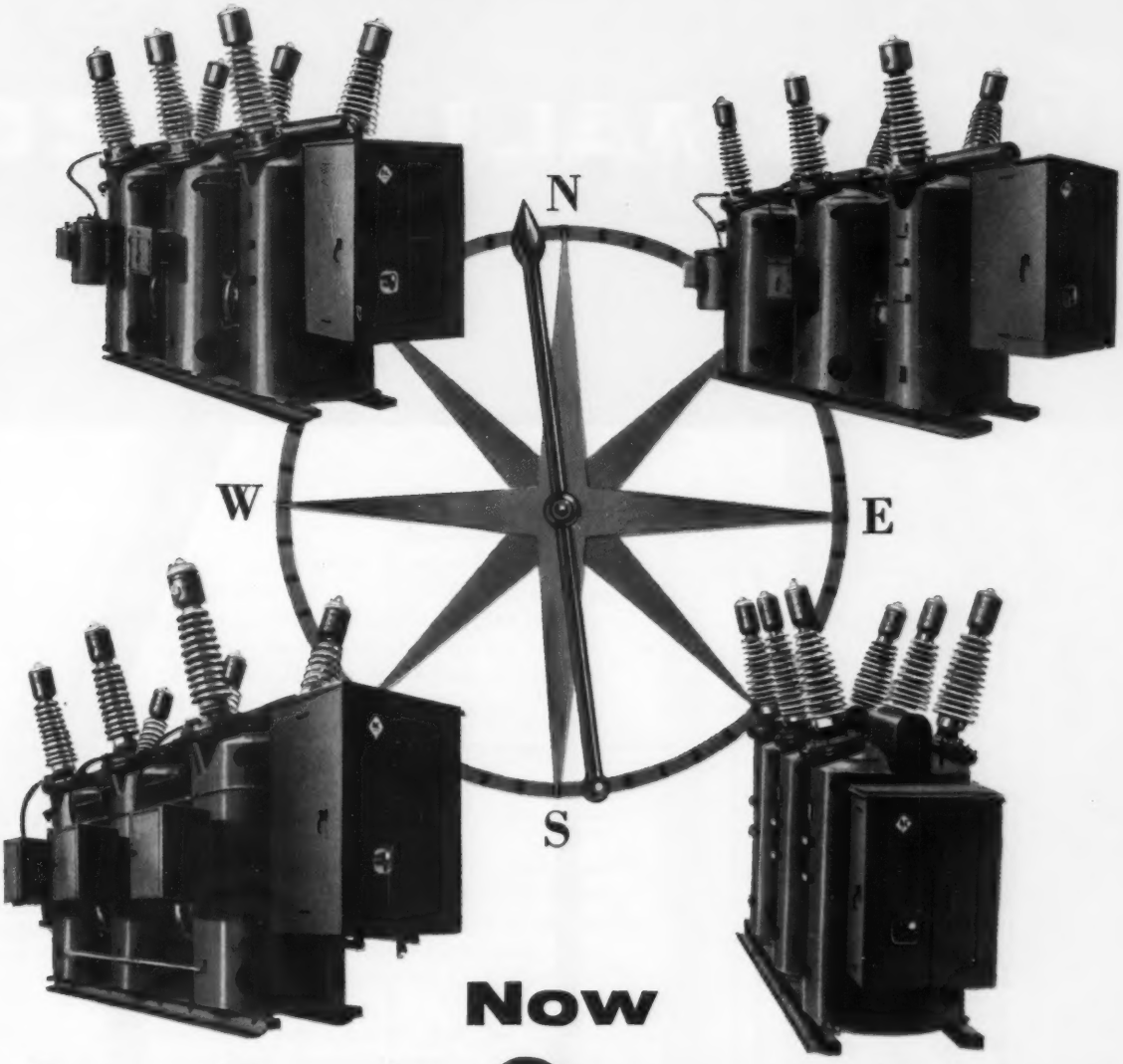
Up to 6 in. outside diameter and up to 3/16 in. wall thickness, conductivity 97.40% IACS minimum.

Up to 6 in. outside diameter and over 3/16 in. wall thickness, conductivity 97.80% IACS minimum.

All sizes over 6 in. outside diameter, conductivity 98.40% IACS minimum.

(b) Skin-effect ratio at 60 cycles per second.

(c) 60-cycle current-carrying-capacity ratings have been computed for 30 C temperature rise in still air at 40 C, conductor with new, bright, mill finish, horizontal and free from all outside magnetic influences.



Now *Pneu-Draulic* Operators

used on ~~30~~ 39 Power Systems

In the last six months, 9 more power systems have installed Allis-Chalmers hydraulically operated circuit breakers.

This is remarkable acceptance and it's due to several reasons. *Pneu-Draulic* operators are both simple and reliable . . . and they eliminate such common operating problems as moisture, condensation, dust and dirt.

Repeat orders are growing, too. This in itself is proof of the excellent performance of breakers with these operators under a wide range of field conditions.

Isn't it time you try an Allis-Chalmers breaker with *Pneu-Draulic* operator on your system?

Get information from your nearby A-C office or write for Bulletin 71B7942. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4972

SMALL SIZE

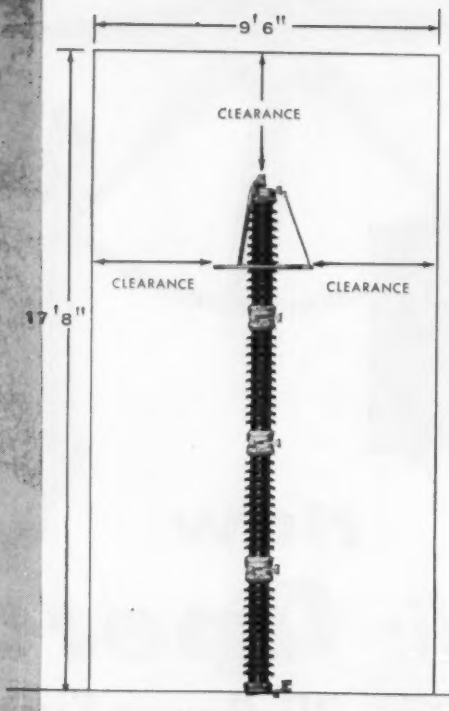


FIGURE NO. 1

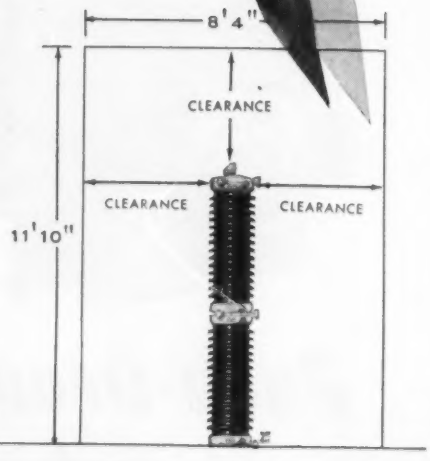


FIGURE NO. 2

Scale comparison of conventional lightning arrester, Thorex MP-121, with Thorex MPR-121, at 138-kv operating voltage. Many opportunities exist to apply the MPR in "close-quarters" locations, where its fine protective characteristics can be made more available to vital apparatus. Likewise, the chance often exists to effect economies in station construction becauseof Thorex MPR's radically smaller dimensions.

OF THOREX

lets you put the best lightning arrester in the best spot

How much space does a lightning arrester take - - and is this space worth anything?

Let's talk in terms of equipment used in regular 138-kv service. Conventional arresters are typified by the Thorex MP-121. (Figure 1) But the Thorex *MPR*-121 stands in a class by itself. Only in the MPR are internal elements arranged in tandem; almost cutting the height in half. Only in the MPR are grading rings eliminated below operating voltages of 161 kv.

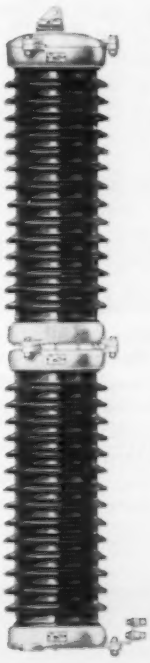
Note Figure 2. The Thorex MPR requires little more than half as much room!

Small dimensions sometimes permit mounting an arrester on station steelwork where it may be extremely convenient and effective. Small dimensions fit in with low headroom applications. Small dimensions let you put the arrester closer to its associated apparatus - - a vital element in maximum protection.

Many power companies have found that the Thorex MPR lets them put the best available arrester protection in the best spot. Where will the MPR answer some of *your* problems?

OHIO BRASS COMPANY . MANSFIELD, OHIO

4633-H



THOREX MPR-121

* TECHNICAL COMPETENCE

the heart of every Ohio Brass arrester

Novel Interrupter Operates With Small Oil Volume

E. J. FIELD, Assistant Chief Engineer, R&IE Equipment Division, I-T-E Circuit Breaker Co, Greensburg, Pa.

This new method of interrupting load and fault currents on high-voltage circuits developed out of the author's realization that only a relatively small volume of oil is actually functional in a single interruption. The large volume of hydrogen gas generated by decomposition of this small quantity of oil is the principal agent in the interrupting process.

The oil-column interrupter illustrated affords a means of trapping the necessary oil where it cannot be dispersed by arc-generated pressure and delivers it to the arc at the arc's most intense point. No supplemental energy is needed.

In the diagram the non-conducting chamber, B, has lateral ports or vents within which a moving contact, H, engages a set of stationary contacts, G. The moving contact extends upward through the interrupting chamber, either as a continuous uninterrupted tube or as an enlarged section, C. Both the moving contact and its extension are hollow. A set of ports, D, at the top of this hollow tube admits fresh oil, and the piston, E, is held in a fixed position by a contact rod extension terminating in a main framing member, F.

As the moving contact separates from the stationary contact, a small volume of oil confined in the hollow moving contact is held stationary by the piston. In effect, the moving contact slides off the oil column, progressively exposing new and cool oil to the hottest portion of the arc where the arc terminates on the retreating tip of the moving contact.

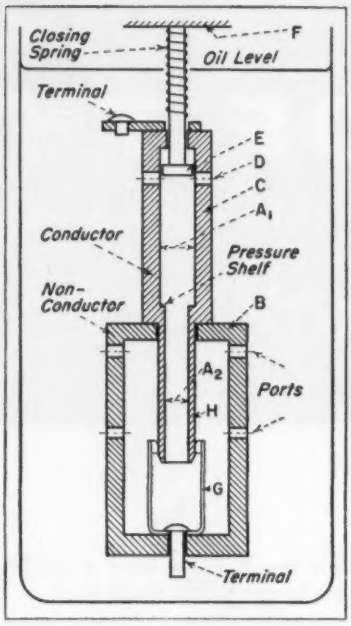
Fresh oil continuously exposed to intimate contact with the arc is broken down into a highly effective volume of deionizing gas. Effectiveness is augmented by the gas being generated within the bounds of the arc, where pressure coincident with gas generation forces the deionizing gas through the walls of the arc. Ionized arc products are discharged rapidly through lateral vents under the impetus of the high pressure developed within the interrupting chamber.

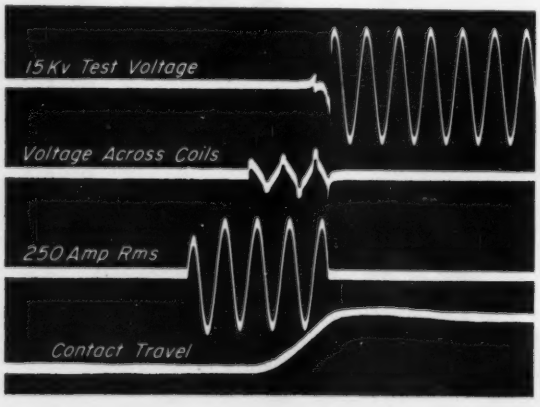
Tests have established that the oil-column single-contact interrupter is practicable on circuits up to at least 34.5 kv. In multiple-contact construction, the interrupter is applicable to oil circuit breakers for high transmission voltages. Simplicity of the single-contact construction makes it particularly desirable for interrupting devices used at the lower distribution voltages, such as 15 kv. First commercial application was in a high-speed automatic circuit recloser of the power class for 15-kv service.

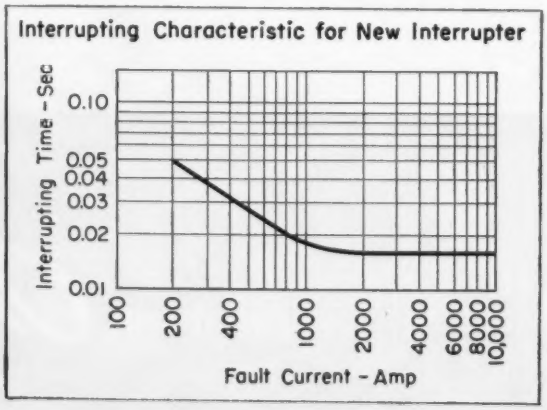
The device was designed for short arcing time and low arc energy interruption, characteristics which protract the useful life of circuit breakers by extending contact life and minimizing oil deterioration for each interruption. Short arcing time at high and low fault current magnitudes and over a wide range of normal frequency recovery voltages is evident in oscillograms.

As adjacent moving and stationary parts are metal-to-metal, mechanical interference is precluded. Nor is there progressive impairment of interrupting ability, as erosion of fibre parts does not contribute to the arc extinguishing action. The curve, plotted from test data, shows circuit interruption one cycle after inception of a fault for currents up to 10,000 amp.

(*More How To on page* 120)

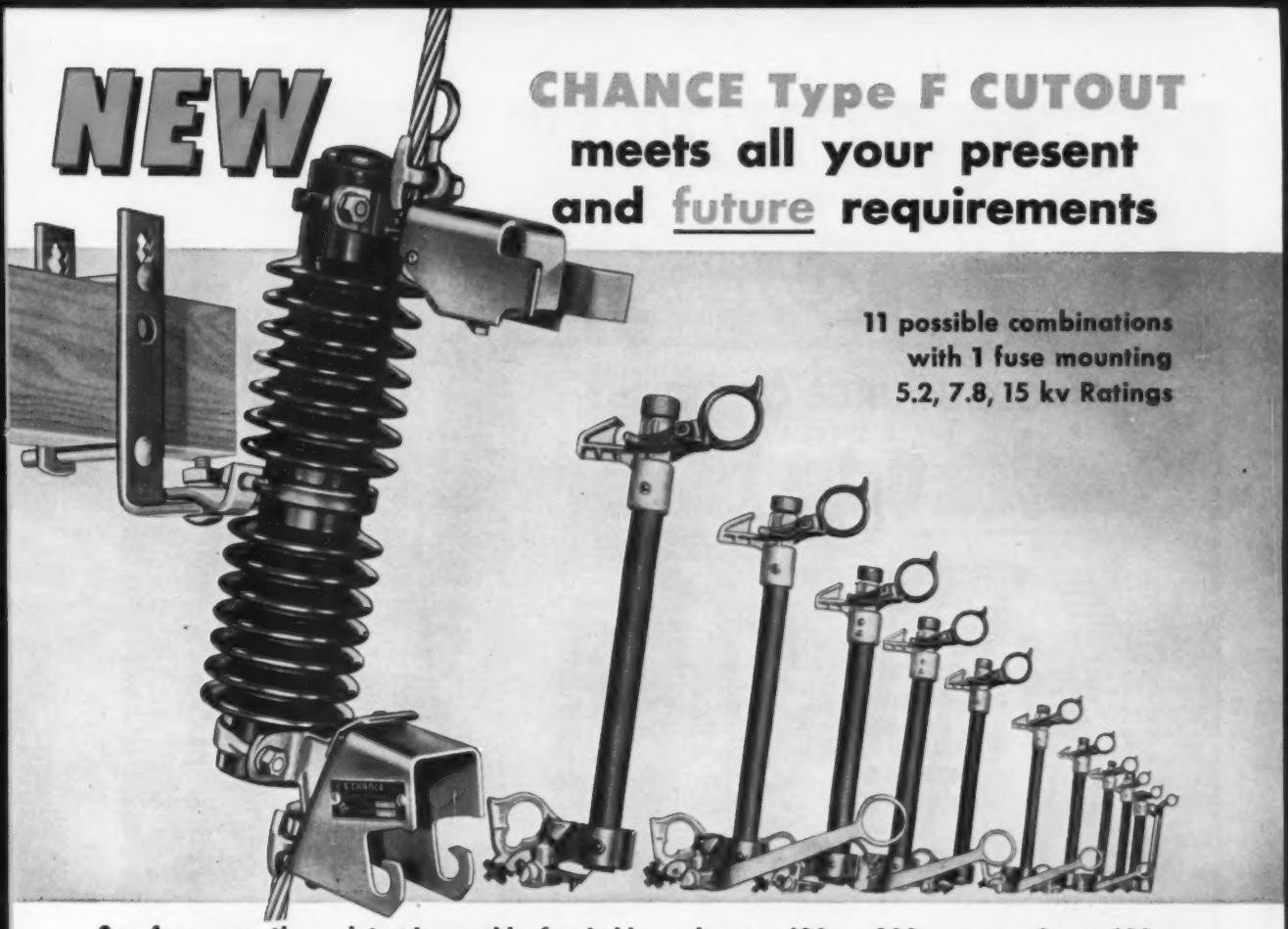






NEW

CHANCE Type F CUTOUT
meets all your present and future requirements



11 possible combinations with 1 fuse mounting 5.2, 7.8, 15 kv Ratings

One fuse mounting—interchangeable fuseholders give you 100 or 200 amp regular or 100 amp load break cutouts—interrupting capacities 2000 to 12000 amps, plus a disconnect

Here's a way to simplify your cutout stocking problems—lower storage, handling and installation costs. With the Chance Type "F" line of cutouts, you stock only one type of fuse mounting and a choice of fuseholders for complete system protection. You can choose from *eleven* different combinations, including a disconnect, to fit your exact needs. And when you want to up-rate an installed cutout or convert it to load break, a simple change of fuseholders does the job—*in the same fuse mounting!*

The Type "F" Cutout combines 16 important features asked for by distribution engineers in a nationwide field check . . . and *only* the Chance Type "F" offers *all* these features! Check the table below. Ask your Chance Distributor to show you this new Cutout line, or write us.

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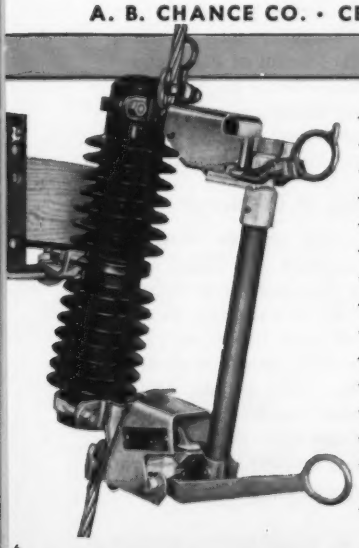

	Chance Type "F"	Cutout "G"	Cutout "H"	Cutout "J"	Cutout "K"	Cutout "L"	Cutout "M"	
Interchangeable Fuseholders Covering Complete NEMA Range	YES	NO	YES	NO	NO	YES	NO	NO
Wrap Around Insulator Bolts	YES	YES	NO	YES	YES	NO	NO	NO
Bird Proof Construction	YES	YES	YES	YES	NO	YES	NO	YES
Lift and Tie Ring	YES	NO	NO	NO	NO	NO	YES	YES
Universal Terminals	YES	YES	NO	YES	YES	YES	NO	NO
Sleet Hoods at Both Ends	YES	YES	NO	YES	NO	NO	NO	NO
Positive Guiding of Tube	YES	YES	YES	YES	NO	YES	YES	YES
Positive Latch	YES	NO	NO	NO	NO	NO	YES	NO
All Contact Surfaces Silver Plated	YES	YES	YES	YES	NO	NO	YES	YES
Self Cleaning Contacts	YES	YES	YES	YES	YES	NO	YES	YES
Lever Action When Opening	YES	NO	NO	NO	NO	NO	NO	NO
Link Ejector	YES	NO	NO	NO	NO	NO	YES	YES
Load Break	YES	YES	YES	YES	YES	YES	YES	NO
Fuseholder Cannot be Installed Backwards	YES	YES	NO	YES	YES	YES	YES	YES
180° Stop to Prevent Fuseholder Swinging Back into Pole	YES	NO	NO	YES	YES	NO	NO	YES
NEMA Standard Mounting Bracket	YES	YES	YES	YES	YES	YES	YES	YES

-6

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
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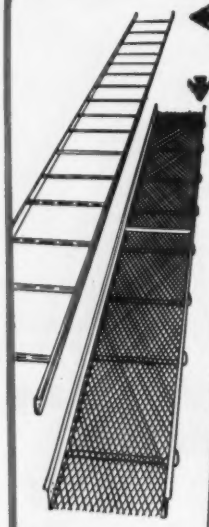
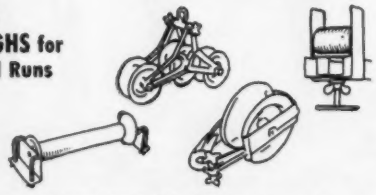
Complete to the Last Bolt



CABLE RACKS for Power Circuits
CABLE BASKETS for Control Circuits
CABLE TROUGHS for Limited Runs

LONG SPAN SUPPORTS for Bridging Applications



INSTALLATION TOOLS for fast cable "pulls"

PLUS over 1,000 items of accessory hardware including:

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hanger rods	wall brackets
support channels	cable clamps
pipe spacers	cable banding
concrete inserts	insulator blocks

Lowest Ultimate Installed Cost
THRU SAVINGS IN FIELD ERECTION

- LIGHTWEIGHT ALUMINUM—faster installation
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HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

Third Battery Increases Station's Flexibility

Recent installation of a 120-cell, 800-amp-hr Planté-type battery has increased flexibility as well as protection against battery failure at the Lake Road generating station operated by the City of Cleveland.

Two other stationary 120-cell batteries, installed when the station was built 15 years ago, can now be taken out of service for examination and repairs. All three batteries alternate in powering the control circuit, emergency lighting circuit, and power circuit, although two batteries are adequate to supply the power required. One battery now is available for stand-by service and to permit testing and maintenance of any one of the three.

Powers Control Circuit

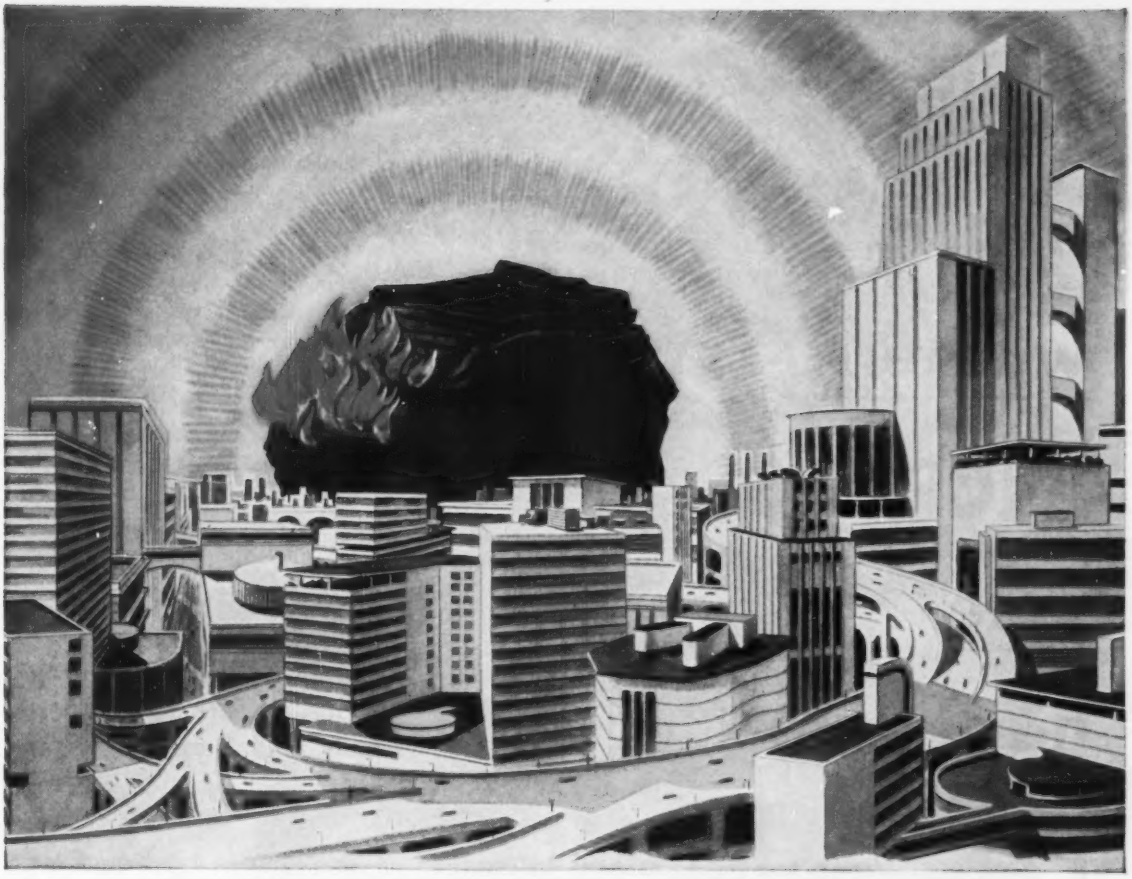
The batteries provide dc current for three circuits. One is the emergency lighting circuit, consisting of lights to illuminate key areas in event of a failure of the regular current. During an emergency, air compressors can be operated by battery current. At all times magnets to remove tramp iron, suspended over conveyor belts carrying coal, are powered by battery current.

The batteries continuously power the control circuit, and scores of circuit breakers are actuated intermittently by battery power to switch 11,000-v current to the various substations. Many fractional hp control motors are powered by the batteries also. For example, the governor, regulating the amount of steam entering the turbine—hence the speed and output of the generator—is controlled by a $\frac{1}{10}$-hp motor which operates intermittently on battery power.

Can Replace M-G Current

Several $\frac{1}{8}$-hp motors, rated at 0.8 amp, regulate the boiler draft openings by changing the position of baffles over the blower inlet. In each boiler control panel is a $\frac{1}{10}$-hp motor which actuates a rheostat controlling current to the boiler damper control motors. Steam from the boiler header enters a Borden tube, and movement of the tube is amplified by a system

(*Continued on page* 122)



The fuel that sparked our nation's growth secures her greater future

A young America—primed by a new and power-packed fuel—became a great industrial giant almost overnight. Coal had supplied the first unwavering spark which was to grow into the brightest productive flame the world has ever known.

After being served so well in the past and present, America looks again to dynamic coal for greater prosperity and security in the future. The vast Bituminous fields along the Baltimore & Ohio contain excellent coals in wide variety—available for centuries to come.

Highly mechanized mines, equipped and ready for any demands, will help maintain long-range cost stability. And improved utilization methods will meet the increased requirements of the future by providing greater coal-burning efficiency.

CALL ON OUR COAL TECHNICAL SERVICE

You'll receive complete information from trained B&O experts about the kind and size of Bituminous coal that fits your needs best—at a price you want to pay. Write:

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BITUMINOUS COALS
FOR EVERY PURPOSE

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Baltimore & Ohio Railroad

Constantly *doing things* **— better!**

M|F

malleable iron

HIGH CORROSION RESISTANT

washers

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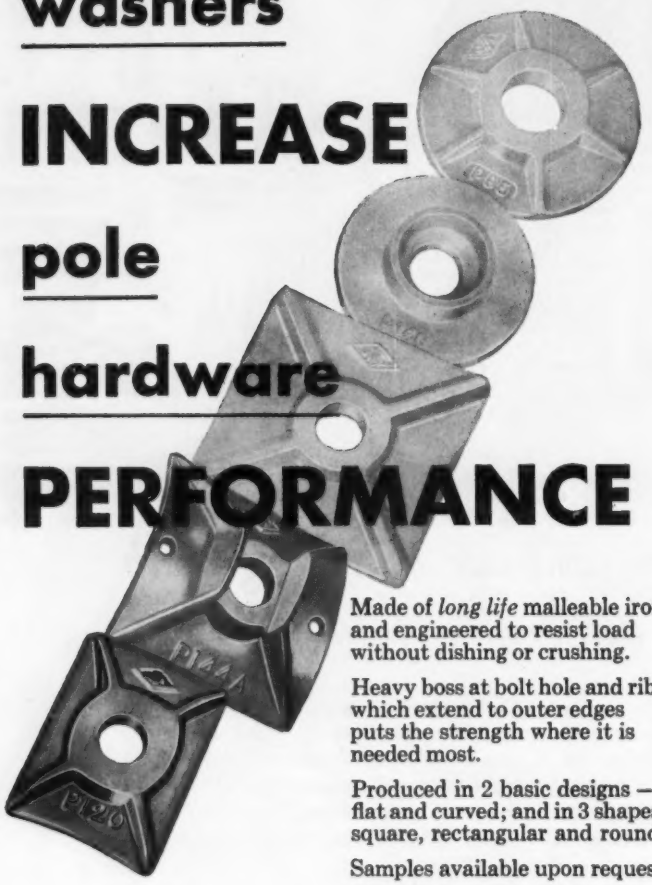
pole

hardware

PERFORMANCE



Made of *long life* malleable iron and engineered to resist load without dishing or crushing.

Heavy boss at bolt hole and ribs which extend to outer edges puts the strength where it is needed most.

Produced in 2 basic designs — flat and curved; and in 3 shapes, square, rectangular and round.

Samples available upon request.

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POLE HARDWARE DIVISION Branford, Connecticut
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Adds Third Battery

(*Continued from page* 120)

of levers and relays which signal the $\frac{1}{10}$-hp control motor to change the boiler damper openings to produce the steam required by the load at the time.

Batteries on Float Charge

Batteries are on float charge. Three motor-generator sets supply the current for keeping the batteries up to full capacity at all times. All three are diverter pole machines, two with a 15-hp motor turning a 10-kw generator and one a 25-hp motor connected to a 15-kw generator. When power to the motor-generator sets is interrupted, the batteries can supply current for several hours.

GENERATION—Operation

Steam Turbine Replaced By Two Diesels

The first opposed-piston stationary diesels to operate at 900 rpm have completed two years of standby and peaking service in the Bemidji, Minn., plant of the Otter Tail Power Co. Installed in a 25-by-35-ft space, the engines provide a combined capacity of 4,800 hp.

Otter Tail, with headquarters at Fergus Falls, Minn., has a system extending over a three-state area serving 486 communities in Minnesota, North Dakota, and South Dakota. It is company policy to provide maximum protection against outages, utilizing carefully spaced generating facilities as well as interconnections with adjoining power systems. In the past five years, the company spent more than $20,000,000 on improvement of transmission and generating facilities.

Steam Turbine Retired

At the end of 1954, Otter Tail had nine steam, seven hydro, and 24 internal-combustion generating plants with a total nameplate capacity of 123,290 kw. In the last year, these plants produced 421,328,000 of the system's 563,150,000 kwhr total.

In 1953 Otter Tail retired from

(*Continued on page* 124)

Announcing
ADVANCE
BALLAST SERVICING PLAN

This ADVANCE Fluorescent Lamp Ballast Servicing Plan has been established to save time and money for electrical contractors, lighting equipment manufacturers, engineers, electric utilities, architects and users of fluorescent lighting equipment. To serve you in this program ADVANCE, the world's largest exclusive ballast manufacturer, has appointed a nationwide network of service-stocking distributors. These authorized distributors carry a complete stock of ADVANCE ballasts and will replace, WITHOUT CHARGE, any ADVANCE ballast which becomes inoperative within the two-year warranty period. Also, from this ADVANCE stock, which includes ballasts to operate all fluorescent lamps, they offer immediate replacement service for any other make ballast.

The ADVANCE label is your assurance of dependable, efficient performance at lowest cost . . . the result of years of engineering and development that have made ADVANCE fluorescent lamp ballasts "The Heart of The Lighting Industry".

The new ADVANCE Buyer's Guide, the Cross-reference Fluorescent Lamp Ballast Replacement Chart together with the brochure listing authorized ADVANCE Service-Stocking Distributors will be sent to you without cost or obligation. Write today!

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PHILADELPHIA ELECTRIC COMPANY

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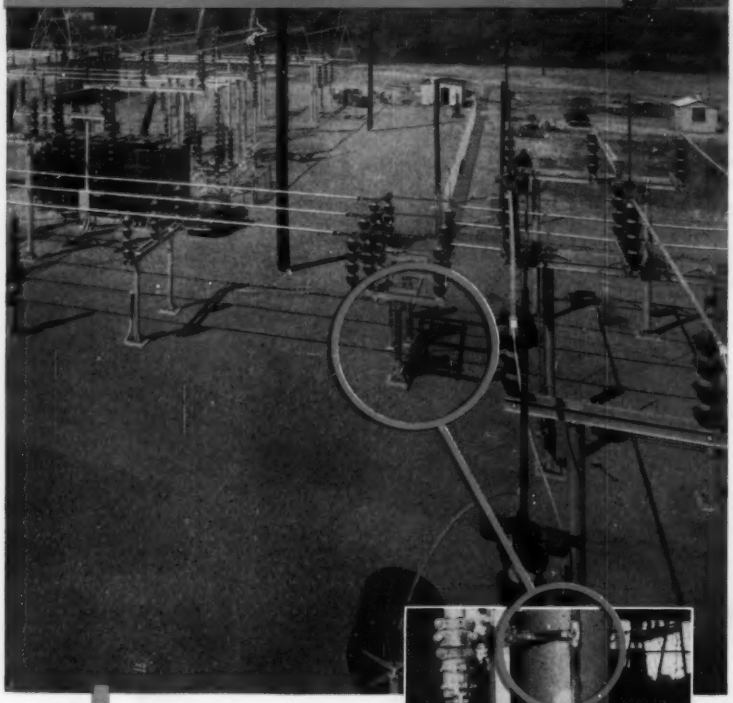

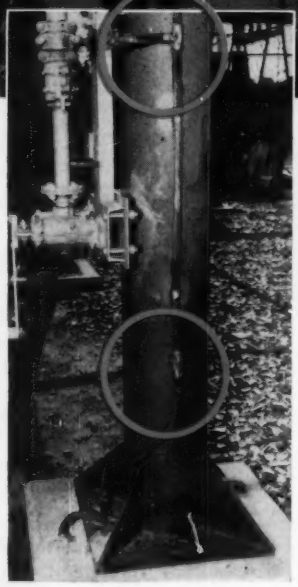

Adequate grounding on a utility power system is of paramount importance for the protection of personnel and equipment. A complete line of connections has been developed with the co-operation of Erico Products, Inc., that makes it possible for us to use Cadweld connections on all of our heavy capacity ground circuits.

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Diesels Replace

(*Continued from page* 122)

service an aging 2,500-kw steam turbine at Bemidji, leaving a 3,000-kw steam unit in service as a base load generating unit. A replacement for the retired turbine was considered essential.

The company had no wish to reduce system capacity in the face of an expanding load. The plant, out near the end of a long transmission line, would be called upon in the event of a line outage to serve the city of Bemidji with its 10,000 population. Sound operating policy called for a standby unit in the plant to carry the station's normal load during emergency, or scheduled maintenance of the steam turbine.

Hp/Space Ratio Better

Diesels provide a great deal of horsepower for the space they occupy and permit quick emergency starts. A turbine, it was estimated, would take 60 to 80 min to be put on the line, but a diesel installation can be engineered to be started, put on the line, and brought up to full load within 10 min.

The engines installed are two identical two-cycle, opposed-piston diesels, each with 12 cylinders of 8⅛-in. bore and 10-in. stroke. Each is rated for this standby service at 2,400 hp at 900 rpm and drives a 2,125-kva, 1,700-kw, 2,400-v alternator. The two, with 3,400-kw capacity, are in the space occupied by the 2,500-kw turbine.

Have Common Foundation

It took a month to remove the steam unit and cut the foundation down 18 ft to the footing supported on pilings. A common foundation with steel reinforcement was poured on the original caps. Installation of the engines was speeded because the 3,000-kw turbine was carrying the load without relief and was long past the normal time for scheduled maintenance.

The generators, last piece of major equipment to arrive, reached the site September 29. The diesels went into operation October 29. Then, after 18 months of service, the turbine was shut down, and the new diesels ran without shutdown for 27 days while maintenance was performed on the steam unit.

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM POWERS-AMERICAN AERIAL EQUIPMENT

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For Placing Workmen in "HARD-TO-REACH PLACES"

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Getting to out-of-the-way, hard-to-reach working areas is a breeze with Sky-Master. Twin, insulated work baskets carry workmen up, out, over, or down . . . provide on-the-ground comfort that speeds up overhead work.

Sky-Master—with accessory equipment for your job—can be furnished on a Powers-American Body that fits your exact requirements. Literature and prices on Sky-Master—in a size for reaching 42′ or 48′ above ground—will be sent on request.

Powers-American Division

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR STREET • BERKELEY 10, CALIF.

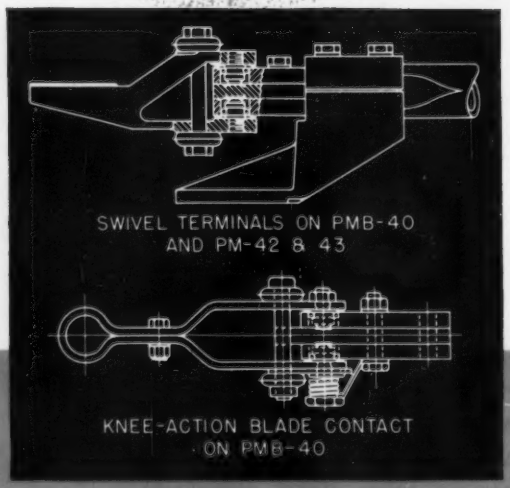
NEW! **PMB-40 Braidless Side-Break Switch. Knee action blade provides toggle action—makes operation easy when entering or withdrawing blade from high pressure contacts. Ratings from 7.2 kv to 161 kv; 400, 600 and 1200 amperes; standard fault ratings.**

Now... Delta-Star featuring high-pressure

Important feature with BIG advantage—extremely low friction swivel terminals

Up to now, braidless side-break switches presented a serious problem in developing high pressure contacts without creating excessive friction at the swivel terminals. These terminals must be exceptionally free to prevent drag on the line wires.

Delta-Star's new rotating contact design solves this problem. *The high pressure contact is placed directly on the center of the rotating insulator.* Thus, heavy pressure at the contact point does not develop torsional resistance. The swivel terminal is supported by two pairs of ball bearings located out of the current path.



Diagrams at left show construction details of the low friction swivel terminal contacts.

DELTA-

NEW! PM-40 Braidless Double Side-Break Switch. Rotating blade applies contact pressure. Ratings from 69-H kv to 330 kv; 600, 1200 and 1600 amperes; standard and heavy fault ratings.

NEW! PM-42 Braidless Center-Break Switch. Toggle action of blades makes operation easy when high pressure contact is made or broken. Ratings from 7.2 kv to 230 kv; 600 and 1200 amperes; standard fault ratings.

offers new braidless side-break switches on-center contacts and low-friction swivels

Not until Delta-Star engineers fully approved each new feature were they willing to introduce these new horizontal-break braidless switches. Now they're proved and ready!

Not only are braids effectively and completely eliminated, but these switches also incorporate other important improvements. These include new, high-pressure switch and rotating contacts and free-action, low friction swivel terminals.

Blade and contact construction of these new horizontal-break switches is patterned after Delta-Star's highly-regarded MK-40 vertical break switches. Hard drawn copper contact shoes with silver inlays are backed by non-current carrying, beryllium copper leaf springs. Large deflections assure uniform contact pressure after years of wear. Rotating hinge and knee action blade contacts, with silver button pressure units, are factory-sealed. Ball or pin bearings permit rotating terminals to operate freely—cannot bind or lock.

Bearings are rustless, greaseless—completely sealed against the elements—require no lubrication during the lifetime of the switch. Double race stainless steel balls and stainless steel races are used throughout all ratings.

Here are horizontal break *braidless* switches that operate effectively, successfully and most satisfactorily—if operated only on rare occasions, or if operated frequently. They are yours *now* for improved operating efficiency.

For all the facts, call your nearby Delta-Star representative

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Robot Controls Speed Soldering Iron Output

- **Results are easily duplicated**
- **Design changes may be accommodated**

RALPH O. SMITH, Industrial Sales Engineer, Connecticut Light & Power Co, Essex, Conn.

Automatic controls are facilitating production of a new industrial type of soldering iron made at Electric Soldering Iron Co, Deep River, Conn.

An electric conveyor, a 16-ft tunnel of infrared heaters, and two 30-sec percentage timers provide smooth heat control for drying varnish on the irons' transformers, and create results that can be duplicated easily from day to day.

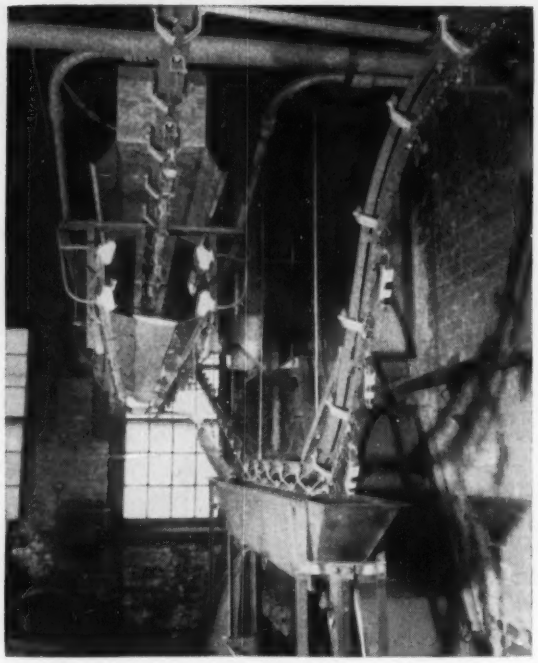
One timer controls six 4-ft heaters at the mouth of the tunnel for quick preheating of the cold transformers as they enter the tunnel after being dipped in varnish.

The other timer controls the remaining light 6-ft heaters to maintain a baking temperature of 275F. Total connected load is 34.8 kw.

It is essential that these transformers be quickly dried. This is guaranteed by the oven-conveyor combination. The conveyor may be varied in speed from 6 to 36 in. per minute. Normal running speed is 12 in. a minute.

The conveyor carries the transformers from the second floor, where assembly begins, to a fireproof room on the first floor. There they are dipped in varnish, baked dry, and returned to the second floor for final assembly. Air may be changed easily in the varnishing room to prevent build-up of dangerous volatiles.

This system is flexible: By varying the speed of the conveyor and the time cycle of the heaters, the equipment may be easily adapted to accommodate changes in product design or material. The equipment delivers consistent results on this production basis with low maintenance cost and trouble-free operation.



SOLDERING IRON TRANSFORMERS, conveyed from second floor, are dipped in varnish at right and dried in oven, left

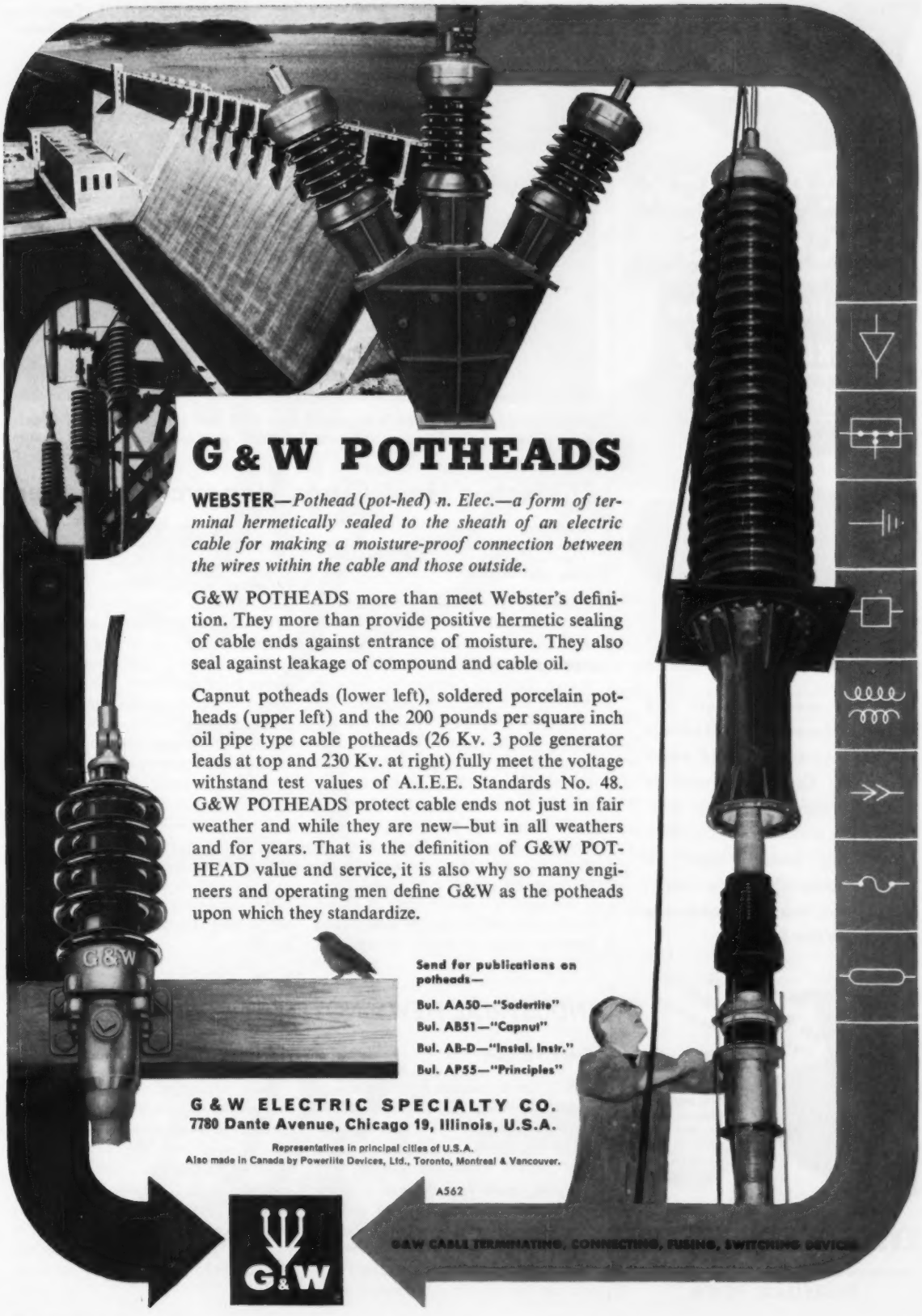
Ball Bearing Sorter Aids Manufacturer

T. WESLEY HICKCOX, Industrial Sales Engineer, Connecticut Light & Power Co, New Britain, Conn.

Automatic controls can help many manufacturers produce more efficiently. A case in point is an electronic ball bearing sorter at Fafnir Bearing Co, New Britain, Conn.

This machine is a completely automatic electronic gage. It is capable of sorting steel balls from $\frac{1}{16}$ in. to $\frac{1}{2}$ in. outside diam at a speed of 10,000 an hour. Some balls must be correct to within tolerances of one 25 millionths of an inch.

Dropping one by one from a feed chute, the balls are pushed between the gage contacts where their exact diameter is measured by the electronic gage head by means of a ray of light. At this point an electrical impulse passing to the electronic amplifier sets up a relay system which actuates the correct solenoid for final classification of the balls. The appropriate trap door opens and the ball falls into the proper tote box.



G&W POTHEADS

WEBSTER—*Pothead (pot-hed) n. Elec.—a form of terminal hermetically sealed to the sheath of an electric cable for making a moisture-proof connection between the wires within the cable and those outside.*

G&W POTHEADS more than meet Webster's definition. They more than provide positive hermetic sealing of cable ends against entrance of moisture. They also seal against leakage of compound and cable oil.

Capnut potheads (lower left), soldered porcelain potheads (upper left) and the 200 pounds per square inch oil pipe type cable potheads (26 Kv. 3 pole generator leads at top and 230 Kv. at right) fully meet the voltage withstand test values of A.I.E.E. Standards No. 48. G&W POTHEADS protect cable ends not just in fair weather and while they are new—but in all weathers and for years. That is the definition of G&W POTHEAD value and service, it is also why so many engineers and operating men define G&W as the potheads upon which they standardize.

Send for publications on potheads—

Bul. AA50—"Sodertite"
Bul. AB51—"Capnut"
Bul. AB-D—"Instal. Instr."
Bul. AP55—"Principles"

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois, U.S.A.

Representatives in principal cities of U.S.A.
Also made in Canada by Powerlite Devices, Ltd., Toronto, Montreal & Vancouver.

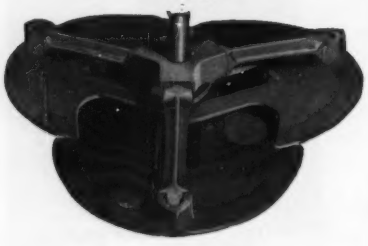
A562

G&W CABLE TERMINATING, CONNECTING, FUSING, SWITCHING DEVICES

The Old Reliable

EVERSTICK ANCHORS...

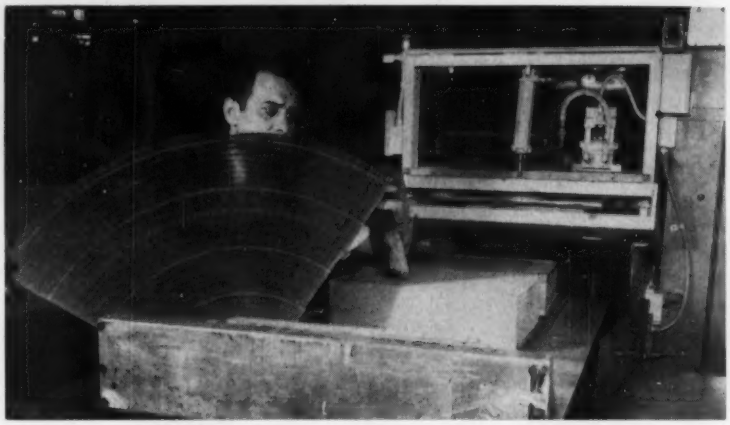
EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
Manufacturers of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA



KRAFT PAPER HONEYCOMB is inspected after 7-12 min curing cycle in dielectric dryer which cures resin adhesive. Former cycle in oven took from 12 to 17 hours

Dielectric Heat Cures Honeycomb Paper

PAUL H. HENRICHS, Industrial Power Engineer, Southern California Edison Co, Los Angeles, Calif.

Substantially greater production of a honeycomb-core paper material with a considerable reduction in rejected product has resulted from the use of dielectric drying by Douglas Aircraft Co, Inc, Los Angeles. Dielectric heat is used to cure the adhesive in the material, called Aircomb, during a curing cycle less than 15 min long. The former curing process in an oven required from 12 to 17 hr to reach the curing temperature. In the old process, material often was charred on the outside and inadequately cured in the center.

Aircomb is a honeycomb of brown kraft paper which may be sandwiched between sheets of wood or metal. It is used as partitions in aircraft, fins for guided missiles, and as paneling for vehicles and buildings. The honeycomb core is formed by application of node lines of resin adhesive to kraft paper before it is folded in a special machine. The adhesive requires 300F and about 100 psi proper curing. Temperatures below this level produce under-curing; higher temperatures cause charring.

Dielectric controlled heat for the dryer is provided by a generator rated 20 kw at 7.27 mc. The dryer can handle 600-800 lb of paper per hour with a curing cycle of 7-12 min for a 104-lb charge having a moisture content of 6-8%. A blower removes moisture and solvents which are driven from the paper during drying.

INDUSTRIAL NEWS NOTES

Giant Vacuum

A 2,200-lb vacuum melting furnace is now working for Vacuum Metals Corp, Syracuse, N. Y., and the National Research Corp. The operator can control from one console the charging, mold transfer and pouring operations. An outgrowth of smaller 10,000-cps, 200-v induction units, the furnace will increase by 60 to 75 tons the monthly potential supply of vacuum melted metal for industry.

Let Instruments Help You

Take advantage of instrumentation for greater operating efficiency, increased product quality, and better use of manpower. This advice comes from W. C. Gardner, instrumentation specialist at C. F. Braun & Co. In the next few years, industry will invest $10,000 per worker for production facilities. Investments in instruments should run from $60 to $500 per man, he said.

"Babe, this here's a ree-tort," explained Paul Bunyan to his faithful Blue Ox. "Fer pressure treatin' wood. Them Baxter folks never dunk it, er spray it, er paint it. They got a real fancy process: They stick the wood inside this ree-tort, lock her up fer 20 hours, and when she comes out she's BAXCO pressure treated—chock full o' presarvatives." The great logger scratched his head with a pine tree. "I dunno how they do it, Babe, but them Baxter boys shore treat wood good—they make it last forever." *

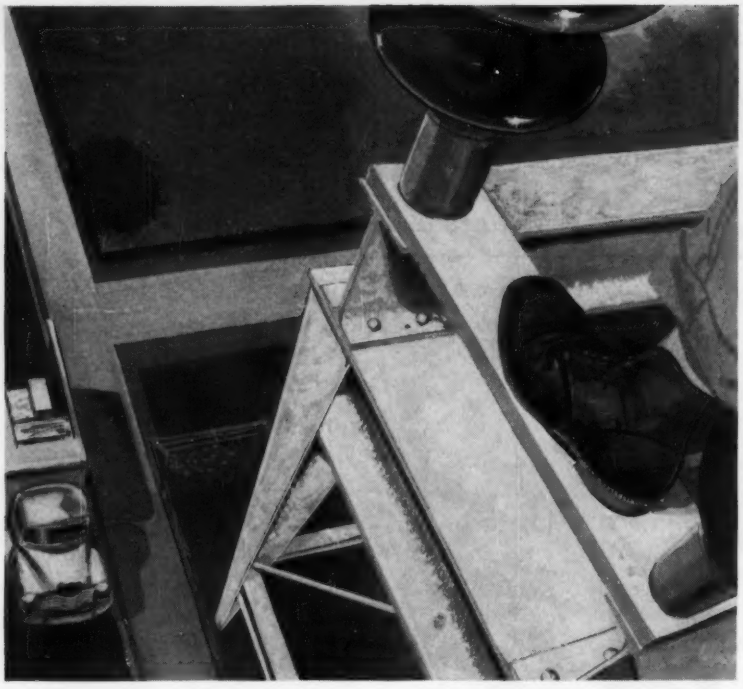
BAXCO
PRESSURE
TREATED
FOREST
PRODUCTS

* Not quite *forever*, Paul—but wood, properly pressure treated, does last up to ten times longer. For maximum long-life protection against insects and rot, authorities agree that wood preservatives should be applied by pressure treating—and BAXCO Forest Products are *always* pressure treated. As West Coast pioneers in the wood preserving industry, our experienced engineering staff can assist in supplying you with the right preservative, the proper treatment, for any job. For a prompt quotation—inquire today.

Preservative treatments available: Creosote, Creosote-Petroleum solution, Creosote-Penta solution, Penta, Chemonite, Chromated-Zinc-Chloride, and Protexol fire retardants.

© J. H. Baxter & Co. 1956

J. H. BAXTER & CO. *120 Montgomery Street, San Francisco 4, California*



How high is up?

It feels like 20 stories to a lineman who is finishing his last connection, only to have a connector bolt snap, or the head break off. Small item? Try climbing down and hunting for a spare bolt or, worse yet, find it's a special bolt that you've got to order out.

You won't find these problems with Royal Connectors. Big ½ inch Silicon Bronze hex head bolts are standard on *all* Royal connectors from ½" IPS and larger, and 500 MCM and larger. Nested bolt heads permit "one-wrench" installation.

Insure the fastest, trouble-free installation and a lifetime of dependable service with Royal heavy-duty Power Connectors. And look for the "Royal Treatment" on delivery, too. Call Royal today!

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

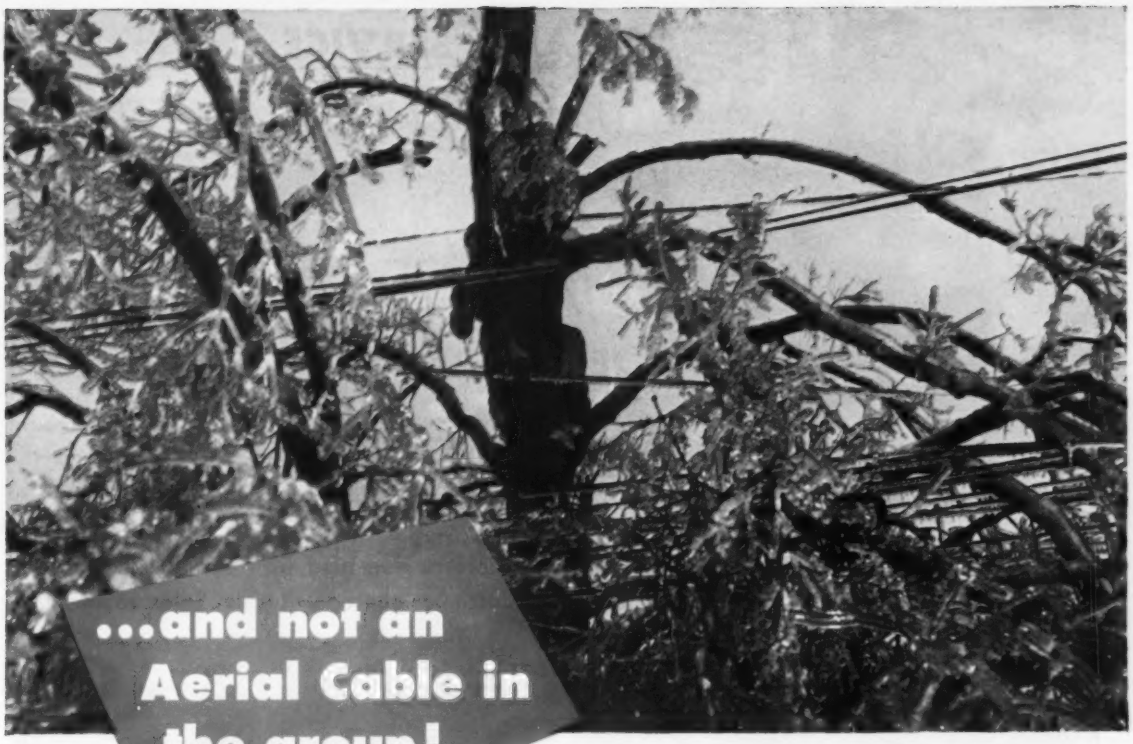
ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

INDUSTRIAL BRIEFS

Heating the concrete floor of Alabama Power Co's new garage at Mobile, Ala., has brought numerous applications for jobs from local mechanics who have heard of it. Company auto mechanics, who spend much time on their backs under trucks, say there is nothing like having a warm back while working. The installation consists of about 7,250 ft of heating cable in the 25 x 100 sq ft area. Total load is 20 kw at 208 v. E. H. Pierce, Superintendent, Mobile Division, Alabama Power Co., Mobile, Ala.

Holding temperature of tallow at the proper level for pumping is done automatically with electric heat in a 6,000-gal underground tank at the Fernando Alfalfa Milling Co, Lancaster, Calif. Because of the presence of highly combustible ground alfalfa in the plant, the inherent safety of electric heat is important. Other considerations in the application are economy, dependability, automatic operation, and little maintenance. The heating system uses 30 kw of immersion heaters to warm oil which then is pumped through a heat exchanger coil in the underground tallow storage tank. Operation of the heaters is regulated by automatic temperature control. Operating tests show the large tank is held at about 120F for an average cost of $0.93 per 24-hr day. B. W. Depew, Heat Engineering & Supply Co, Monrovia, Calif.

Aluminum billets are heated to 800F in about 15 sec in an induction heater used by Capitol Products Corp, manufacturer of aluminum storm and screen doors at Harrisburg, Pa. The 66-lb billet revealed during a test period that 121,197 lb of usable aluminum could be processed with 44,000 kwhr, averaging 0.36 kw hr/lb of aluminum. The 3-phase induction heater demands 442 kva and is equipped with 585 kva of capacitors. The extruding press, driven by a 300-hp motor, was bought and installed for an estimated $250,000 and is expected to pay for itself in six months. The total electrical load related to this operation is 1,002 kva. Harry Fisler, Industrial Representative, Pennsylvania Power & Light Co, Harrisburg, Pa.



From the viewpoint of a distribution superintendent, this is a pretty sad and pretty numbing picture. It shows vividly what nature can do when the conditions are just right. Here, if any place, is an ideal location for a Simplex Neoprene-Jacketed, Self-Supporting Aerial Cable.

It is at times like these that Simplex Self-Supporting Aerial Cables dramatically present their dependability. They have a dependability factor almost as high as cables in underground ducts. Even if whole trees fall on them, their strong copperweld supporting messenger will keep them from breaking. Because they are insulated, the public is not endangered by exposed open wires.

Even if you never have had a storm like this, you still need Simplex Self-Supporting Aerial Cables because they reduce your tree-trimming costs. Swaying branches are no problem for the neoprene-jacketed, Anhydrex-insulated conductor. Special tree wire is unnecessary. They raise the utility in the estimation of its customers by providing a neat, good-looking package.

Simplex Self-Supporting Aerial Cables are easy to splice and tap, and they are readily identified as to phase. Their long service life recommends them most highly to budget-conscious distribution engineers.

If you would like to know how to save money by spending a few dollars for Simplex-ANHYDREX Self-Supporting Aerial Cable, simply address the nearest Simplex branch or the address below. You will be most happy that you did.

Simplex

Self-Supporting Aerial Cables

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

SALES
Residential

A 1-2-3 Plan for Selling Food Freezers

1 CALL ON CUSTOMER: Top Salesman Earl Remaly tells prospect of company's free frozen food offer package

Wisconsin P&L offers free food with purchases, follows it up with close customer contact. Result: Sales zoom 383%

2 ADVISE CUSTOMER: Prospect turns buyer and Remaly helps her chose food items at neighborhood supermarket

3 HELP THE CUSTOMER: WP&L Economist Mary Schnurr aids the new freezer owner in storing her food packages

With just a small twist in its promotion program, Wisconsin Power & Light Co jumped its food freezer sales 383% in one month.

The twist: an offer of 200 packages of frozen food free with the purchase of a freezer, and a three-pronged attack on sales and follow-up.

Money-wise this was no drastic change from previous offers which featured price reductions or frozen food coupons with a given dollar value. But sales-wise it showed a big difference. The "200-package free" deal caught on. Sales during the first month of the offer were a full 383% ahead of those in the same month (May) in 1954. And in the two months following, sales continued high, holding at 195% above the same period in the previous year.

Here's how the offer was handled: Freezer buyers could get their 200 free packages of food from any grocer of their choosing. A Wisconsin P&L salesman or home economist accompanied the buyer to the food store and full retail price was paid for the items. This kept the grocer happy and encouraged him to help push freezer sales. Choices had to be made from a food selection chart provided by the utility. Chart is divided into 10 groups—juices, two groups of fruits, three of vegetables, one of baked goods, one of cooked dishes and meats, and two miscellaneous groups. These selection requirements were such that the customer was bound to get a variety of

(*Continued on page* 139)

When Electrical World's article was being planned, salesmen were told that the top salesman for the last month of the activity would be the one used in the pictures. The winner: Earl Remaly of the Mineral Point district.

UP Distribution Regulator Ratings to 167 Kva

DOWN Cost of Regulation

Here's the best regulator news since Allis-Chalmers originated 5/8% step regulation over 22 years ago:

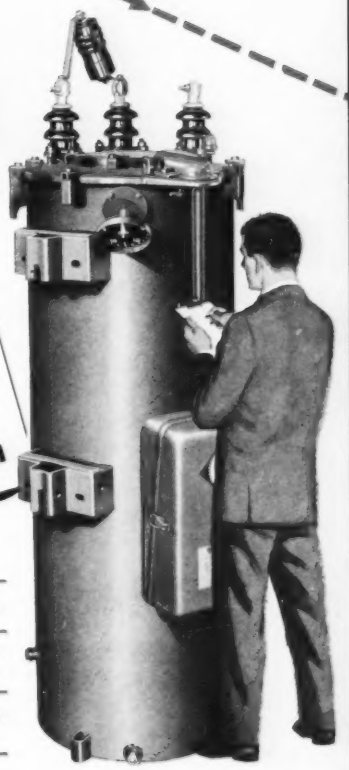
► Now—you can get the same high-quality regulation . . . the same time-proved mechanism you've always had in Allis-Chalmers station-type equipment . . . and . . .

► *At lower cost . . . you can now use single-phase distribution regulators* . . . instead of using station regulators or load tap-changing transformers.

This has been done by taking advantage of over twenty-two years of regulator development. The result — a regulator that combines the advantages of mass production and simplification of parts with the elimination of features that do not directly contribute to regulation.

You get the same 1% control accuracy and 20% range of regulation as in station regulators. Eight years of field operation have proved Allis-Chalmers distribution regulators will stand up under toughest operating conditions.

ALLIS-CHALMERS
Originators of 5/8% Step Voltage Regulation



Ratings Available

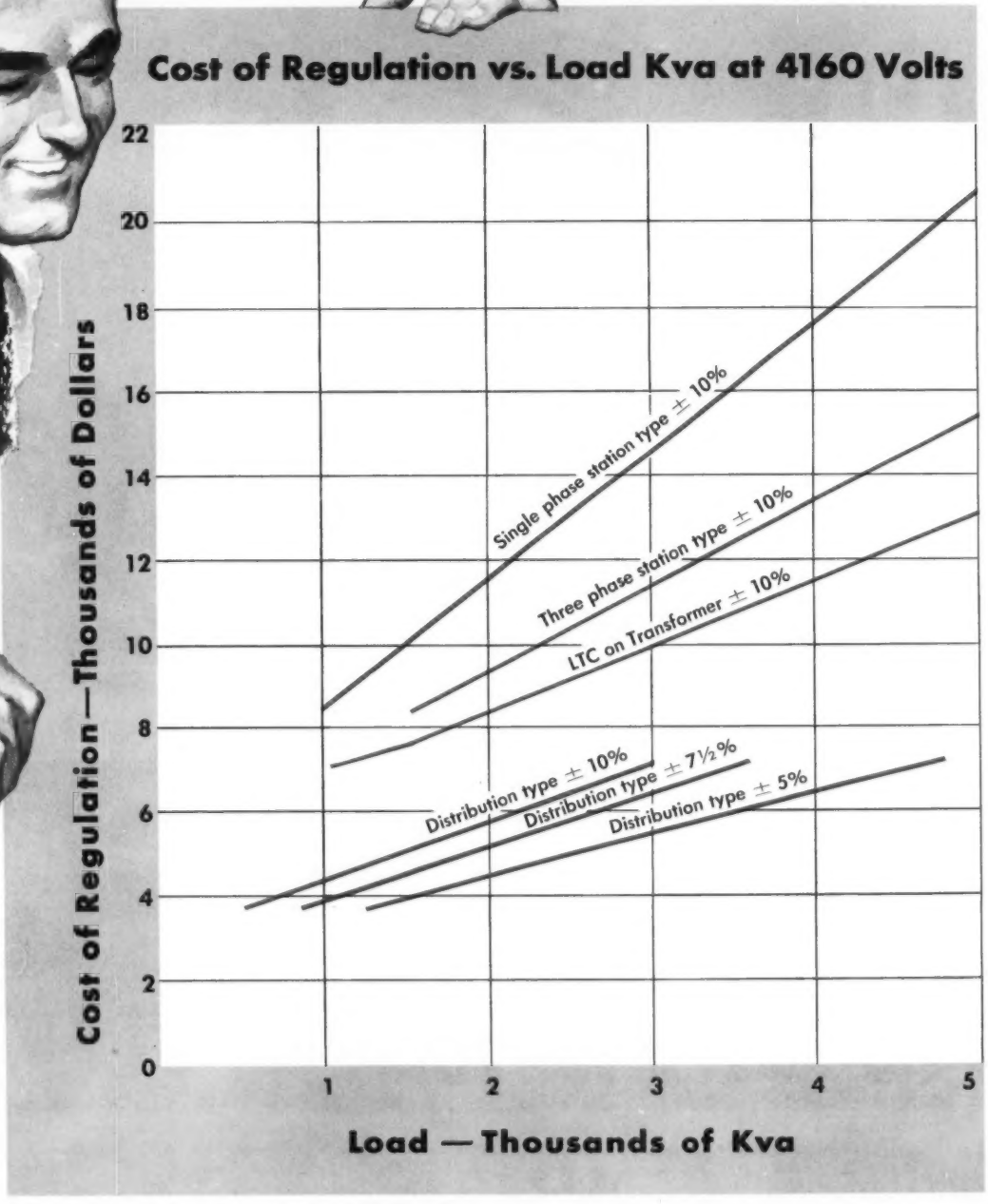
14,400 volts — 50, 100 amp
7,620 volts — 15, 25, 50, 75, 100, 150 and 219 amp
5,000 volts — 50, 100, 150 and 200 amp
2,500 volts — 100, 150, 200, 300 and 400 amp

Chart on Next Page Shows BIG SAVINGS

A-C ALLIS-CHALMERS

A-4946

Save Up



ALLIS-

to 50%

with

ALLIS-CHALMERS
Originators of 5/8% Step Voltage Regulation

New Single-Phase Distribution Regulators

With the low cost of distribution regulators, it may pay you to re-evaluate the methods of voltage regulation on your system. In many cases you'll find it is now possible to bring the advantages of single-phase distribution regulation to every feeder in the system. Everyone benefits. You'll get 1% control accuracy, 20% range of voltage regulation—increased revenue and profits.

In addition to the savings in first cost, you have greater installation flexibility.

Check the Comparison in the chart below:

Type of regulation	3000-Kva Load 4160 Volts, 400 Amp	5000-Kva Load 13,800 Volts, 219 Amp
Three 1-phase station regulators	$14,610	$21,900
One 3-phase station regulator	11,520	15,705
Load tap-changing portion of transformer	9,916	13,206
Three 1-phase distribution regulators	7,050	10,611

Why Pay a Premium of 24% to 100%?

CHALMERS

A-C ALLIS-CHALMERS

Vari-Amp Feature

permits tailoring regulator to system needs

One Regulator Provides

5 Current Ratings

25 Regulating Combinations

Here's what this means: There's no need to use ± 10% regulation if your system can operate more profitably at reduced regulation and increased load.

Or, look at it another way; as loads grow, there's no need to change regulators when Allis-Chalmers regulators are on your system. The *Vari-Amp* feature lets you step up ratings as much as 60% by slightly reducing the range of regulation.

Here's how it works: By reducing the range of regulation you can increase the current-carrying capacity. The *Vari-Amp* feature provides stops that limit the range of regulation in 5 current ratings and 25 regulating combinations.

Also Use Unequal Ranges

You can also get considerable flexibility using unequal ranges of regulation. For example, set the *Vari-Amp* feature to provide 6¼% raise at 135% current, 10% lower at 100% current.

No Extra Cost

The *Vari-Amp* feature is available on all Allis-Chalmers regulators.

Get the full story on this and all the other features of Allis-Chalmers regulators. Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

1-2-3 Plan

(*Continued from page* 134)

foods—a good way to demonstrate the versatility of his new freezer. In all, the 200 packages will fill about one-third the space in a 12-cu ft freezer. Ice cream was not included on the list because it was felt that customers naturally would buy it on their own accord.

Cooperative newspaper advertising was the basic promotional vehicle used. Large ads told of the 200-package offer, small cartoon-type ads spotted throughout the paper dramatized a freezer's benefits. Other activities included: canvass calls, freezer parties and demonstrations, window displays, time-payment plans, and trade-in deals on small freezers for larger models.

The free food promotion was not directed at the rural market because Wisconsin P&L felt it would not have the same appeal. For this reason a price reduction was offered on freezer sizes larger than 17 cu ft instead of the free food plan.

Buck Plugs Blanket

No ordinary redskin wrap-around for him. This Pawnee pitches an electric job. Gag pulled big crowds at West Milbury, Mass. farm field day last fall. Worcester County Electric Co dreamed up the idea.

Aims for Million Plus Water Systems in '56

National Association of Domestic and Farm Pump Manufacturers is eyeing sales of 1 million plus electric water systems this year. Hopes are pinned mainly on a promotional program with dealers and power suppliers which will run from now until May when it is culminated by a "National Water Systems Month." Two promotional kits have been prepared, one for use by water systems dealers, the other for power suppliers to use in working out tie-in campaigns. Kit for power suppliers, entitled "Electric Water Systems Make Meter Readings Grow—May Is National Water Systems Month," includes radio spot announcements and a 15-min radio interview featuring the utility's rural service manager and the manager of residential sales.

Here's a breakdown of the water system sales the association expects to make this year: Non-farm rural (suburban homes beyond water mains), 200,000 installations; commercial (motels, highway restaurants, filling stations, etc.) 50,000; non-farm rural homes presently lacking running water, 101,000; replacement of obsolete or inadequate systems, 262,100; farms lacking running water, 250,000; supplementary systems (for fire protection, irrigation, increased water needs). 497,000 installations.

According to John Hosford, the association's executive secretary, sale of an electric water system can set up a chain reaction worth $3,000 in related equipment sales. He sees Operation Home Improvement and the ACTION program as another big stimulus to this year's sales.

S & SHORTS

Bulb Giveaway at SMUD

Some 3,000 to 4,000 150-w lamps will be given away by Sacramento Public Utility District in a bonus bulb campaign it has just put into action. SMUD gives a bulb to each customer who buys a carton of three or four 100-w lamps. The four-bulb carton plus bonus bulb is advertised as a $1.13 value for 88¢; the three-bulb carton and bonus as a 91¢ value for 66¢. Buyers get their gift bulb by turning in the empty carton at SMUD's main office or one of its 28 pay stations. About 300 retailers are taking part in the campaign.

New Booklet

"Bright Ideas for Ladies", a new adequate wiring booklet aimed specifically at the housewife, has been published by the Armored Cable Section, National Electrical Manufacturers Association. Done in an easy-to-read style, it shows the homemaker the importance of her electrical system and how it works. Copies sell at 10¢ each (for less than 200) with lower prices for quantity orders. Contact NEMA, 155 E. 44th St., New York 17, New York.

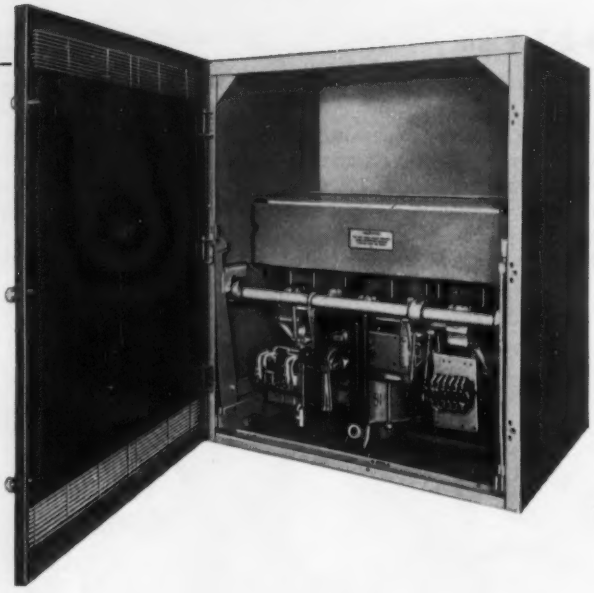
Shorties . . .

Perfection Industries, is adding portable electric heaters to its line of appliances for the first time . . . A new series of radiant glass panels with a deflector top has been introduced by Continental Radiant Glass Heating Corp . . . A built-in double oven equipped with a rotisserie is now being marketed by Norris-Thermador Corp.

The one hundredth certification license issued by the National Adequate Wiring Bureau has been granted to the newly-formed A. W. Bureau of Central New York, Syracuse.

NEW EQUIPMENT

Drawout Switchgear



L-v drawout switchgear accommodates 4,000-amp Type KE circuit breaker in 36-in. wide compartment. It provides small space requirements for breakers with interrupting ratings of 150,000 amp, 240 v, and 100,000 amp, 480-600 v.

Switchgear mounting gives added safety and dust protection because breaker is in test position with door closed. Compartment features cam-type, roll-out mechanism and compact, high-efficiency arc interrupters. Complete information is in Bulletin No. 6004B.

I-T-E Circuit Breaker Co, 19th & Hamilton Sts, Philadelphia 30, Pa.

50-Kvar Capacitor

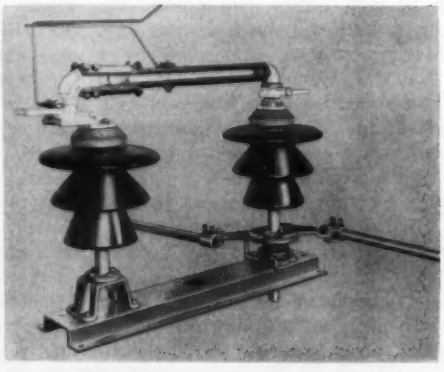
A 50-kvar rating has been added to a line of power capacitors. Compared with the 25-kvar unit, the new rating has same base dimensions, is 10 in. higher, and has about 15% less weight per kvar. It fits standard racks of 15⅝-in. mounting centers.

Manufacturer reports that design, construction and material specifications of the 50-kvar capacitor are comparable in all respects to those of the 25-kvar unit. This includes internal reservoir and operation in ambient temperatures from −40 to +46C.

The line now consists of 25 and 50-kvar individual units rated 2.4, 4.16, 4.8, 7.2, 7.62 and 7.96 kv, also cluster and in-line pole-type assemblies, switched and unswitched. Details are available in Bulletin No. 1121.

Sangamo Electric Co, Springfield, Ill.

Side Break Switch



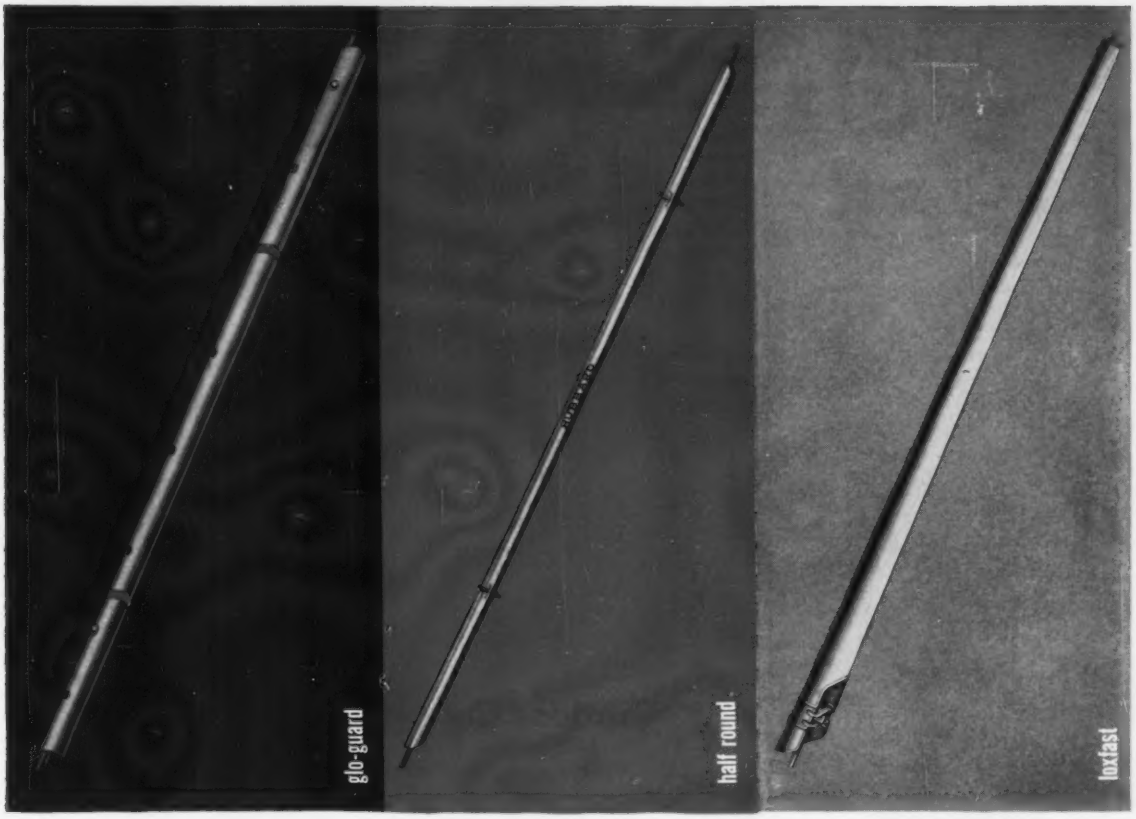
This all-weather, rotating-stack, side-break switch (Type S) is reported to combine easy installation and operation with high mechanical strength and thermal capacity.

Features include: High-pressure, self-wiping, silver-to-silver contacts; sealed, greaseless, stainless steel ball bearings in stainless steel races; and braidless current path.

The switch can be obtained for horizontal upright, vertical, or underhung mounting. It is rated: 400 amp, 7.5 through 34.5 kv; 600 and 1,200 amp, 7.5 through 69 kv.

A. B. Chance Co, Centralia, Mo.

(*More New Equipment on page* 142)



on guard!

Hubbard Guy Protectors are designed to meet the requirements of maximum safety, visibility and shock resistance. Like all Hubbard Hardware, they install quickly, give years of service and have low replacement costs.

The next time you order Pole Line Hardware, check your Hubbard Catalog Number 60. More than 300 Hubbard distributors throughout the United States are ready to serve you.

GLO-GUARD—Two bright red reflective strips give maximum visibility day or night. Glo-Guards are formed from 18 gauge Cor-Ten steel that has a much greater resistance to corrosion and withstands impact to a greater degree than carbon steel.

HALF ROUND—Gives top protection under the most rugged service conditions. Extra rigidity is assured by the turned-in edges. U-Bolt clamping is designed to fit either strand, rod or clamp.

LOXFAST—Installs by tightening one bolt on the bottom clamp. The top clamp is fitted to the guy wire by a clip arrangement. Heavy gauge, double-dipped galvanized steel makes for extra strength, high visibility.

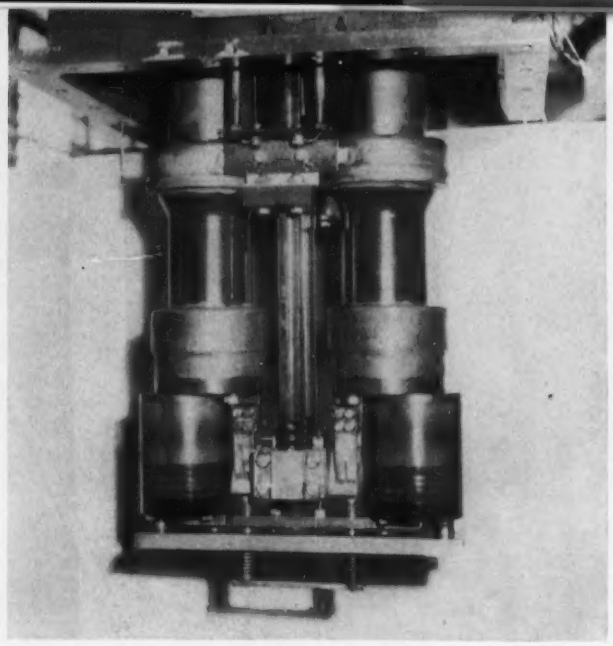
QUALITY! FOR MORE THAN A CENTURY

Secondary Racks • Wireholders • Pole Seats and Balconies • Braces • Drive Hooks • Wood Strain Insulators • Clevises • Extension Arms • Long Span Hardware • Pins • Clamps • Guards • Stubbing Bands • Guy Protectors • Guy Clamps • Pole Struts • Clips • Straps • Hangers • Carriage Bolts • Lighting Standards • Lighting Brackets • Eye Bolts • Pole, Corner and House Brackets • Guy Hooks • Strain Plates • Lags • Machine and Hubeye Bolts • Sidewalk Guys • Autogap Lightning Arresters

HUBBARD AND COMPANY

Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Calif.

Load Tap Changer

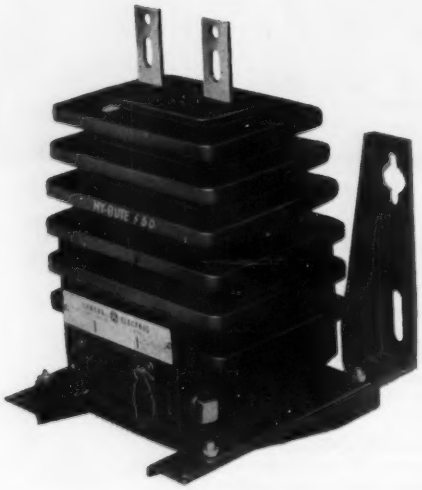


This load tap changer is reported capable of handling transformer banks up to 1,300,000 kva for 20% range in 32 steps.

The high capacity unit consists of: Motor-driven geared dial switch mounted on side of the tank; conventional cam-operated circuit breaker located below the dial switch compartment; and motor-driven mechanism that operates the circuit breaker and dial switch intermittently.

Manufacturer claims the load tap changer is designed for millions of operations under normal service. It utilizes the "Ruptor" arcing principle.

Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.



Outdoor Current Transformer

A h-v current transformer is molded with a new non-tracking organic material known as Hy-Bute/60 insulation. The 15-kv model (JKW-5) is designed for outdoor metering and relaying applications. It can be mounted vertically, horizontally or inverted.

The JKW-5 does away with metal casings and porcelain bushings. Base plate and secondary cover are stainless steel, and terminals are silver-plated copper.

Secondary terminal box is molded in the case as an integral part of the unit, and the stainless-steel cover provides water-tight protection. Primary and secondary coils are of the figure-eight type.

General Electric Co, Schenectady 5, N. Y.

Overload Indicator

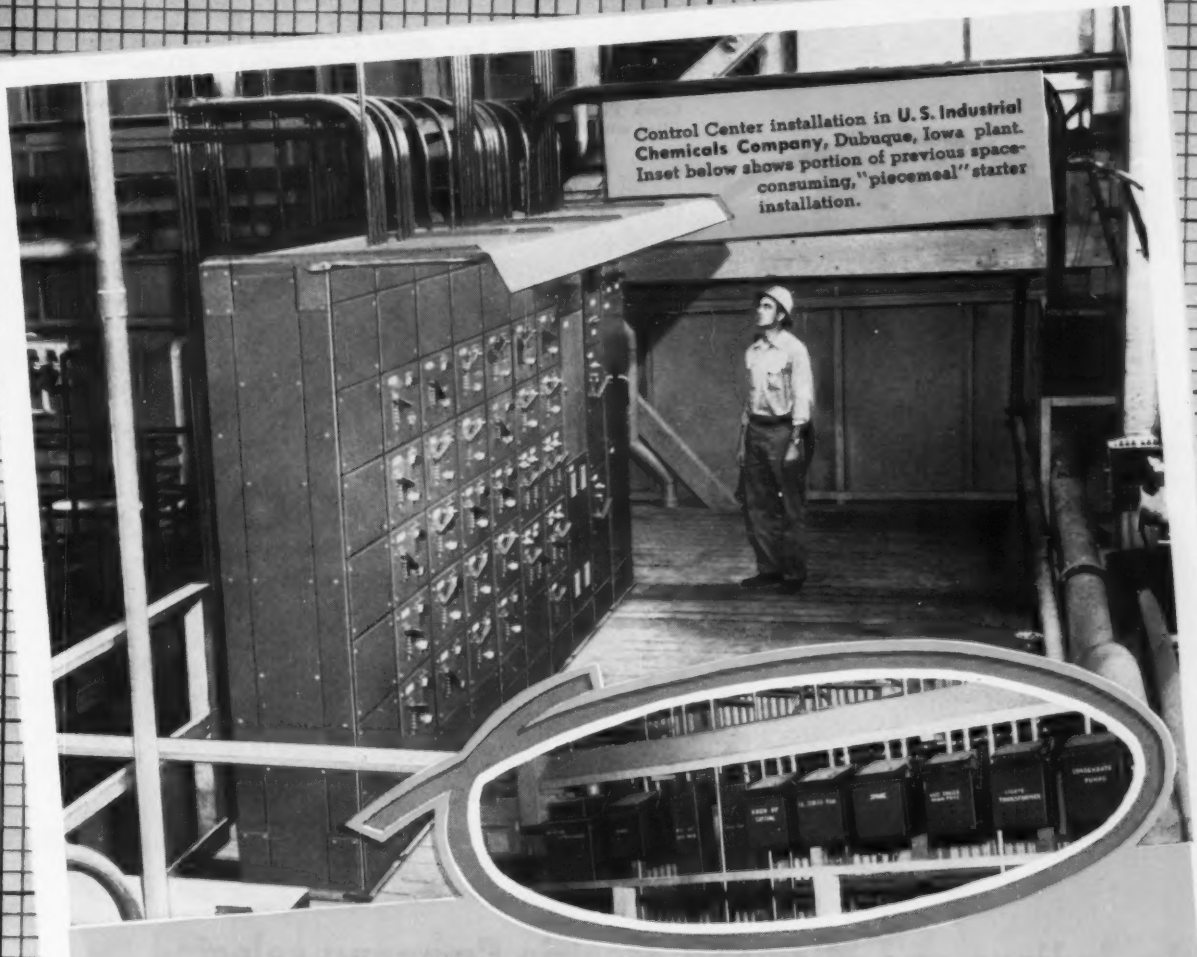
An overload indicator for conventional distribution transformers keeps a permanent and accurate record of overload hours based on copper temperatures.

The new indicator (Type TD) aids in prediction of transformer life, gives advance warning for change-out scheduling, and is easy to read from the ground.

The unit consists of: Bi-metallic, hermetically sealed control thermostat that responds directly to copper temperature; motor or timing mechanism that permanently records overload hours; and signal light that serves as an auxiliary warning.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

(*More New Equipment on page* 146)



Control Center installation in U. S. Industrial Chemicals Company, Dubuque, Iowa plant. Inset below shows portion of previous space-consuming, "piecemeal" starter installation.

"COMPARISON convinced us that a SQUARE D Control Center offered us MORE!"

These design features make Square D <u>your</u> logical choice, too . . .

INCREASED SAFETY because bus bars are fully enclosed, rigidly supported and have ample cross section. Circuits are isolated by individually enclosed plug-in units. Disconnect handle designed for maximum operator protection.

FLEXIBILITY. Individual plug-in units or complete sections are easily added, removed or exchanged. Pushbuttons, pilot lights, and selector switches are readily added to unit doors.

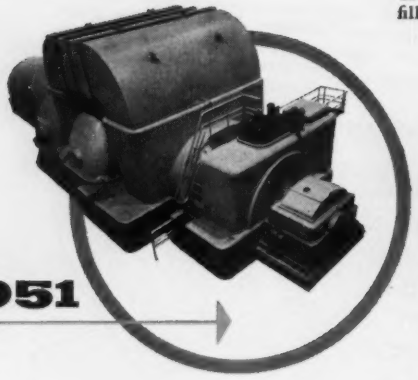
INSTALLATION ECONOMY. All wiring channels are large and accessible from front without removing units. No "wire fishing."

SPACE ECONOMY, TOO. Up to six combination starters fit in a 20" x 20" x 90" section. Plug-in unit heights designed in space-saving increments of 3 inches.

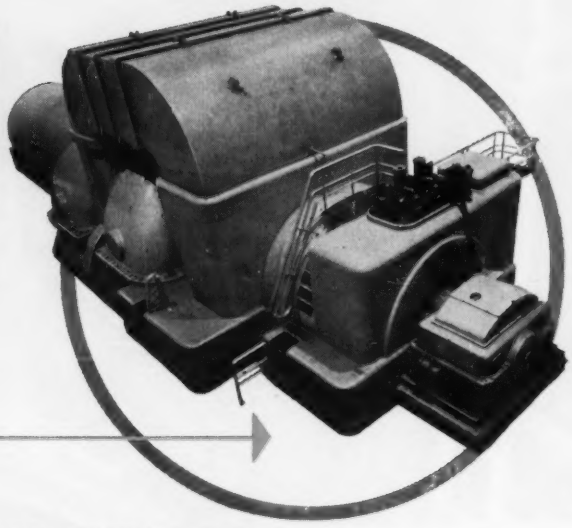
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

Units No. 1 and No. 2 are 150,000 KW General Electric cross compound turbine generators. Unit No. 1 was installed in 1951, and unit No. 2 in 1953, at the Indiana and Michigan Electric Company's Tanners Creek Plant, Lawrenceburg, Indiana. Both lubricating systems were filled with 6500 gallons of Gulfcrest.



...in **1951**



...in **1953**

and again in **1955**

the Indiana and Michigan Electric Company selected

GULFCREST OIL

to provide long range turbine protection

Gulfcrest has an unmatched record of outstanding performance in every make and type of steam turbo-generator. There are two good reasons for its recognition as the world's finest turbine oil.

First, crudes are carefully selected for the best turbine oil properties, then put through the usual refinery steps for oils of this type. Next, the oil is Alchlor Processed—Gulf's exclusive super-refining step which removes the unstable hydrocarbons that form sludge, harmful acids, and accelerate oxidation. Special inhibitors are also added to increase oxidation stability, prevent foam and protect against corrosion.

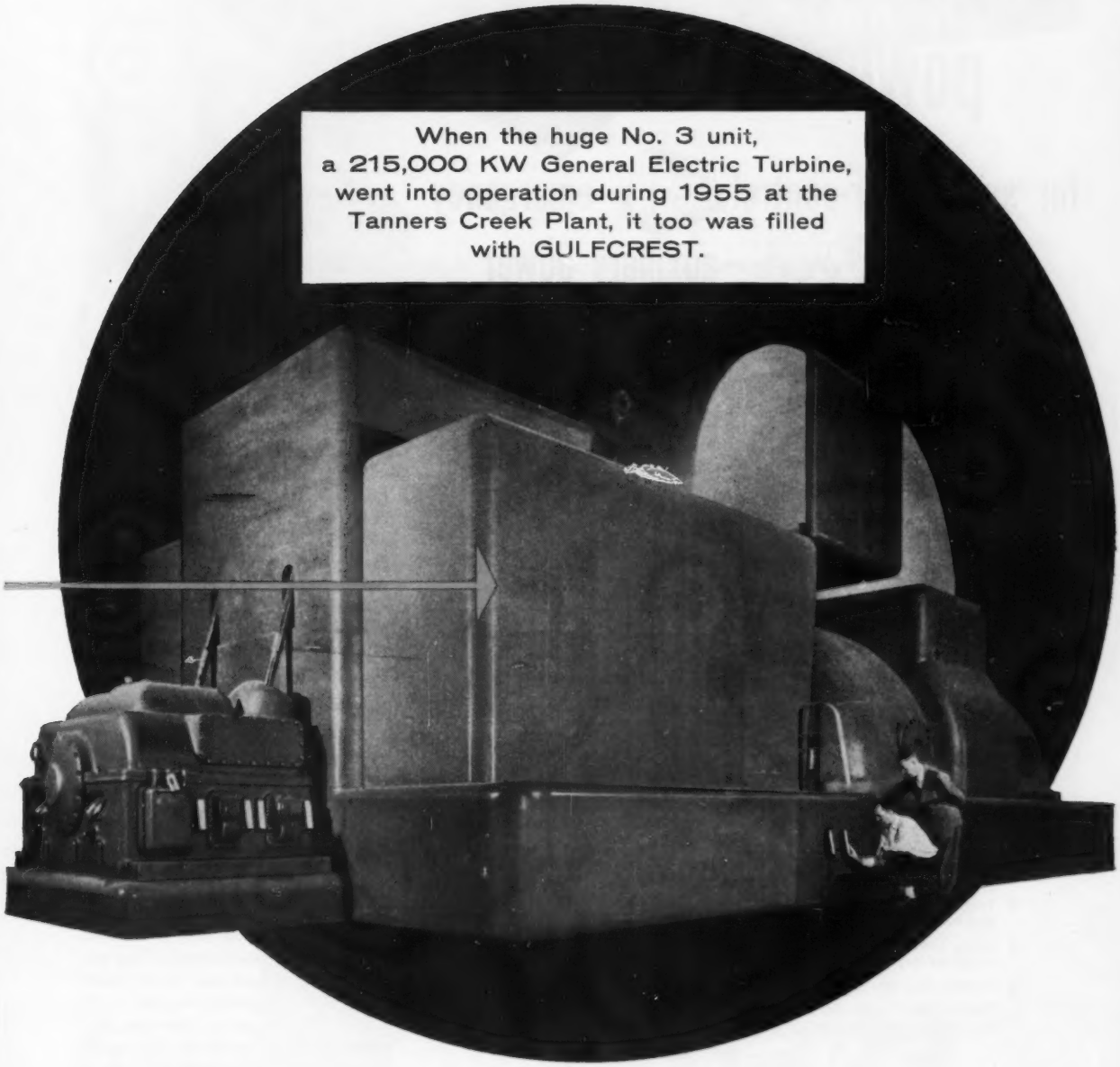
In several large turbines Gulfcrest has been in continuous service for over twenty years. The systems are still free from sludge or rust, and neutralization numbers of the oil remain remarkably low.

The next time you fill a turbine system specify Gulfcrest—and insure safe, long-lasting protection. Consult the telephone directory for the number of your nearest Gulf office and have a Gulf Sales Engineer recommend the right grade of this outstanding oil for your turbines.

Gulf Oil Corporation • Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PA.

When the huge No. 3 unit,
a 215,000 KW General Electric Turbine,
went into operation during 1955 at the
Tanners Creek Plant, it too was filled
with GULFCREST.

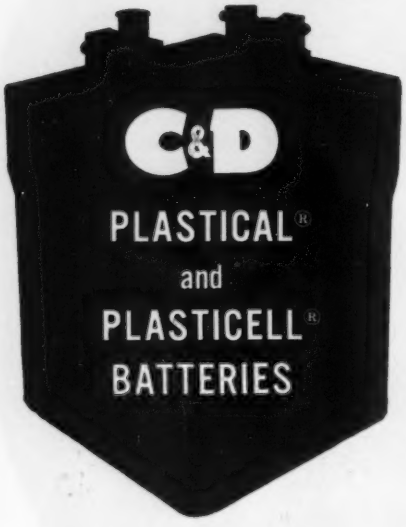


GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Now—"engineered" power

for switchgear-control —emergency lighting —auxiliary power



Compact, modern-design "power plants" engineered for specific applications! C & D PlastiCals and PlastiCells give you completely dependable power—*where power must not fail!*

PlastiCal—with lead-calcium grids for maximum life—is conservatively engineered for at least 25 years in full-float service. PlastiCell—with high-tensile alloy grids—has a projected life of 14 years in float service.

WITH BOTH PLASTICAL AND PLASTICELL YOU GET SUCH ADVANCED C & D DESIGN EXTRAS AS:

1. Extra-long life—exclusive design combines advantages of both suspended and supported plate construction.
2. Triple insulation—thick Fiberglas mat, microporous separators, and perforated Koroseal retainer.
3. Saftee-Vent—outstanding C & D development that prevents accidental battery explosions.
4. Crystal-clear plastic jars—heat-resistant and hermetically sealed.
5. Plastite Post Seals—for easier maintenance, and at the lowest lifetime cost.

Write for C & D Specification Bulletins:
CP-536 Rev. 1 on PlastiCal Batteries
CP-537 Rev. 1 on PlastiCell Batteries

C&D BATTERIES, INC.
of Conshohocken, Pa.
Industrial Batteries since 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

Isolated Phase Bus

New design in isolated phase bus is an all-welded aluminum basic assembly which is factory fabricated and shipped in one piece. It is said to combine strength, light weight, and structural simplicity.

For mounting, two supporting rings for each basic assembly (see illustration) furnish rigidity and quick alignment. Easy opening for inspection is gained from a telescope-type, two-way sliding cover with V-clamp closure. It requires one single-piece, o-ring gasket in each cover joint.

I-T-E Circuit Breaker Co, 19th & Hamilton Sts, Philadelphia 30, Pa.

DC Motors, Generators

A line of dc motors and generators is designed for versatility of application and performance. Speed is adjustable by armature voltage control, field strength control, or combination of both. Higher base speeds are available, and higher top speeds may be obtained by field strength adjustment. The motor can operate at any speed below base, including stalled torque.

The line, known as Kinamatic, features dripproof enclosure and guaranteed 15% service factor. Class B insulation is supplied, and reduced armature inertia permits faster speed of response. All ratings and accessories are available from one to 150 hp and ¾ to 100 kw.

General Electric Co, Schenectady 5, N.Y.

(*More New Equipment on page* 148)

Want smaller, lighter transformers and oil circuit breakers?

Then **LOCKE'S TYPE U** is the bushing for your apparatus!

FOR 92 KV AND ABOVE

Type U is the high voltage apparatus bushing which gives you all the desirable electrical characteristics of earlier bushing designs PLUS the added advantages of smaller dimensions and lighter weight.

For example, Locke's 161 KV Type U bushing is 6¼" *smaller* in ground sleeve diameter, and 590 lbs. *lighter* than its equivalent of earlier design. There is no sacrifice in dielectric strength.

Specify Type U for your apparatus, and chances are good you'll find that your transformers and oil circuit breakers will come to you accordingly smaller and lighter.

For replacement purposes, Type U is ideal because you can handle it more easily during installation . . . and less storage space is required.

Consult your apparatus manufacturer, or send today for complete descriptive literature.

Unusual Radio Noise Test Procedure . . .

Photo shows radio noise test of 287.5 KV Type U bushing. (Today, radio noise is almost zero.) *Each* and *every* Type U bushing is radio noise tested both *before* and *after* one minute ASA standard high potential dry withstand test. This procedure is unusual as the common industry practice is to test on a selected sample basis. Locke makes this and other extra tests to insure uniform bushing reliability.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Here's the PITCH
for faster, more economical anchoring

CHANCE BLACKFOOT ANCHORS

Can be installed by machine to cut line construction costs

Here's a screw anchor that goes down fast and easy whether your line crews install it by hand or by machine. A king-size thimbleye on the Chance Blackfoot will accommodate a big turning bar for easy hand installation. And when you machine-install a Chance Blackfoot Anchor, you reduce installation time to a minimum—which means a big savings in time and money!

What about holding power? Dynamometer tests on a Chance 15 inch Blackfoot Screw Anchor showed no creep at 22,000 pounds!

SMALLER HUB

Smaller hubs on Chance Screw Anchors mean less friction—easier installation. Less earth is disturbed during installation. That's why the Blackfoot has greater holding power.

PITCH CONTROLLED

This accurately pitched, fast cutting blade really goes down fast. Every size anchor is individually "pitch controlled."

Man! that anchor comes down fast!

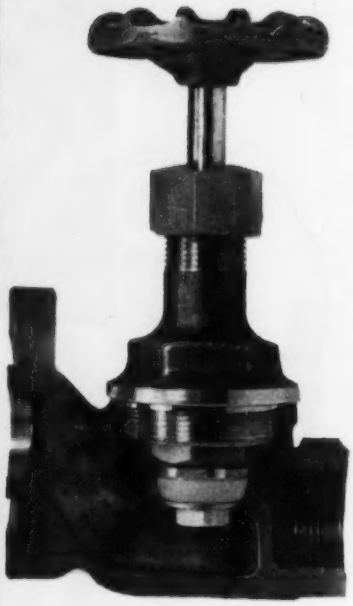
"ANCHORING" is the most complete guide to anchoring and guying ever developed. It shows how to choose the right anchor for every job—and how to install it *right*. Send for your copy!

A·B·CHANCE CO·

CENTRALIA, MISSOURI

San Francisco, California • Pittsburgh, Pennsylvania

CA56-0



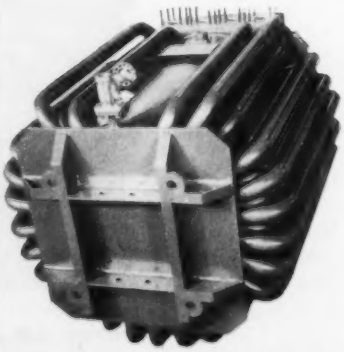
Distribution Transformers

Two developments for substation-type distribution transformers (225, 333 and 500 kva) were announced recently.

• Oil-drain valve is designed to permit all transformer oil to drain out freely. The valve seat, positioned ⅛ in. below transformer tank bottom plate, is made of nylon and brass. To eliminate leaky pipe threads, valve is designed to bolt to a heavy flange nipple where it is sealed by a corprene gasket in a gasket-retaining groove.

The sampling valve is mounted high on the valve body to facilitate sampling. Special drain valves are available with sampling devices that operate without opening the drain valve.

The oil-drain valve can also be used on all larger transformers.



• Sled-type base has steel runners that allow the transformer to slide easily in any direction over all sur-

faces. Continuous welds secure the steel-channel base to the transformer bottom plate and also prevent corrosion at the joints. Holes in the base members provide ventilation and thereby prevent condensation and corrosion.

The base plate's corners, strengthened by gussets, are open above and below the plate to allow sufficient space for jack clearance. Each gusset has holes so the transformer can be pulled or guided.

Moloney Electric Co, 5390 Bircher Blvd, St. Louis 20, Mo.

Pneumatic Fishline

A compact, portable, air-operated fishline is reported to make it possible to fish cable in minutes through underground conduits of any diameter or length.

A flexible steel cable is shot through the conduit to the "target" manhole. When the manhole is reached, the propellant air is turned off and the projectile removed. For it are substituted cleaning tools and pulling wire or cable. The line is retrieved and rereeled by an air motor engaged through reduction gears to the reel.

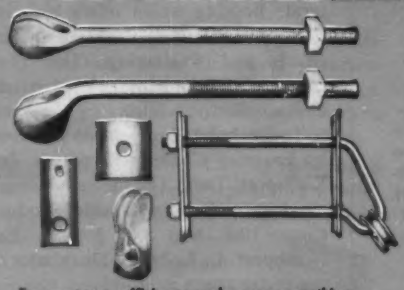
The Neoprene cups, available in a range of sizes up to 10 in., are reported to be flexible yet resistant to wear and effects of water, oil, and sunlight.

T. J. Cope, Inc, 711 S. 50th St, Philadelphia 43, Pa.

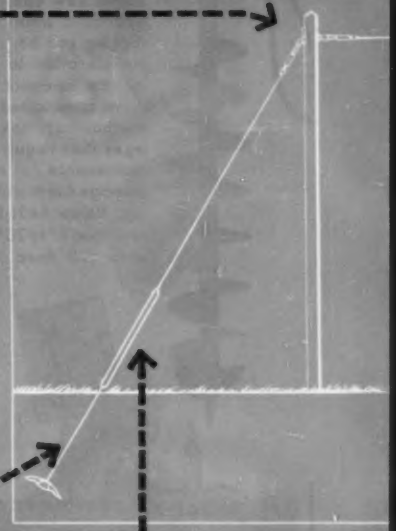
(*More New Equipment on page* 150)

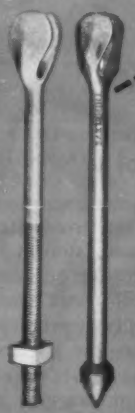
CHANCE guying equipment

GUY FIXTURES



For neatness, efficiency and economy nothing equals Chance Guy Fixtures on the pole. They save the wrap-around strand, and the full-rounded Thimbleye gives complete strand protection during slack pulling operations and when in use. Chance fixtures are drop forged from high grade steel—heavily galvanized. The line includes everything for the guy—Straight and Angle Thimbleye Bolts, Angled Thimbleyes, Thimbleye Nuts, Straight Away and Down Guy Loops, Guy Wire Clips, Curved Washers and Supporting Plates.





GUY RODS

There is a difference in anchor rods—in the shape of the eye and in the galvanized protection. The full rounded Thimbleye design, an A. B. Chance Company development, protects the cable from strain at any angle of pull, prevents binding and aids slack pulling. You get the same protective contour in Thimbleye, Twineye, or Tripleye Chance rods, Threaded or Never-Creep types. You also get long life because the galvanizing on Chance rods exceeds ASTM specifications.

GUY GUARDS

The Chance MONO-BOLT Guy Guard is the standard choice of hundreds of utilities. The Mono-Bolt combines safety, durability, and economy with simple installation—only one nut to tighten—on the lower end—easy to reach. Half round or full round, in 7 and 8 foot lengths. Fits any size rod from ½" to 1¼".

A·B·CHANCE CO·

CENTRALIA, MISSOURI

San Francisco, California • Pittsburgh, Pennsylvania

CA99-8

read all about it!
SEND TODAY FOR YOUR COPY OF THE NEW CATALOG ON
HOLAN'S 4401-H HYDRAULIC DIGGER
• New catalog shows how easy hydraulic hole-digging can be. No vibration to jar the operator . . . no complicated mechanical linkages that require maintenance . . . no damage due to stalling. Holan 4401-H digs holes 8″ to 20″ wide . . . 8′ deep.

J.H. HOLAN CORPORATION
4100 WEST 150TH STREET
CLEVELAND 11, OHIO
OTHER PLANTS: GRIFFIN, GA.; PHOENIX, ARIZONA; BRANTFORD, ONTARIO

To: J. H. Holan Corporation
4100 West 150th Street
Cleveland 11, Ohio

Please send me the factual technical bulletin about Holan's 4401-H Portable Hydraulic Earth Borer.

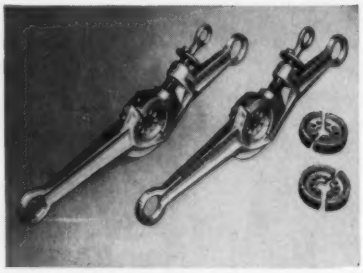
Name_____ Title_____
Address_____
City_____ Zone_____ State_____

Plastic Meter Cover

Utilities can reduce meter cover replacement costs with the help of this meter cover which is molded of a weather-resistant formulation of clear Tenite butyrate plastic.

Easy reading of meter dials is also reportedly accomplished with the butyrate housing which offers high impact strength and resistance to glazing effects and weathering. The 11-oz cover is said to be simple to handle and install.

Tenite butyrate plastic is marketed by Eastman Chemical Products, Inc, Kingsport, Tenn. The meter housing is molded by Popular Plastic Products Corp, 10th Ave and 3rd St, East Northport, L. I., N. Y. Distributor of the meter cover is:
Graybar Electric Co, Inc, 420 Lexington Ave, New York 17, N.Y.



Armor Rod Tool

Two armor rod installation tools are designed to facilitate live-line installation of pre-formed, straight or tapered rods. They feature one-piece construction of the heat-treated aluminum carrier to simplify insertion of loaded dies and locking the assembly on the conductor.

Bronze dies prevent dragging or

(*Continued on page* 155)

read all about it!
HOLAN Heavy-Duty DERRICK
LIFTS LOADS TO 12,000 POUNDS
If you have big ideas for a derrick, the Holan 3700 has the muscles to carry them out. Front- or rear-mounted, the 3700 lifts loads to 12,000 pounds . . . sets and handles poles up to 75 feet long.
Write for the new 3700 catalog that tells all about it.

J.H. HOLAN CORPORATION
4100 WEST 150TH STREET
CLEVELAND 11, OHIO
OTHER PLANTS: GRIFFIN, GA.; PHOENIX, ARIZONA; BRANTFORD, ONTARIO

To: J. H. Holan Corporation
4100 West 150th Street
Cleveland 11, Ohio

Please send me the factual technical bulletin about Holan's 3700 Power Derrick.

Name_____ Title_____
Address_____
City_____ Zone_____ State_____

In power plants...
REPUBLIC ELECTRUNITE E.M.T.
IS EASY TO INSTALL

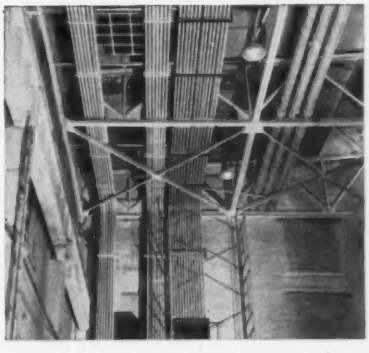
In fact, handling and fabricating Republic ELECTRUNITE® E.M.T. is so comparatively easy you're bound to save on installation costs.

ACCURATE BENDS are easy to make thanks to the exclusive Republic "Inch-Marking" feature on all popular sizes. By aligning these markings with calibrations on the Republic Bender precisely, the right degree of bend is obtained—every time. Another exclusive feature—the Guide Line—helps keep bends in the correct plane, avoiding costly "wows." And the uniform ductility of Republic's high-quality steel makes 90-degree bends possible with surface smooth and unwrinkled, inside and out.

Rain- and concrete-tight couplings and fittings are used with Republic E.M.T. There are no threads to cut, no runs to turn, every connection is a union. Lasting joints are made by strong, compression fittings. And since threading is unnecessary, the galvanized coating is unbroken—providing permanent end-to-end corrosion and circuit protection.

Republic "Inch-Marked"® Electrical Metallic Tubing has been on the job in utility installations for more than 25 years—and still going strong. For your modernizing or new building program, it will pay you to check costs and advantages. E.M.T. is produced to A.S.A. specifications C-80.3, Federal specification WW-T-806 and is approved by Underwriters Laboratories. Write for all the facts. *Send for your free copy of 76-page ELECTRUNITE bending instruction booklet.*

It's dependable, too



The Iowa-Illinois Gas and Electric Company reports *no trouble in more than 20 years of service.* In fact, Republic ELECTRUNITE E.M.T. proved to be such a good long-term investment it was again specified for a big installation in this company's Moline Generating Station in 1953. Those are the old runs to the far left in picture.

REPUBLIC STEEL

STEEL AND TUBES DIVISION

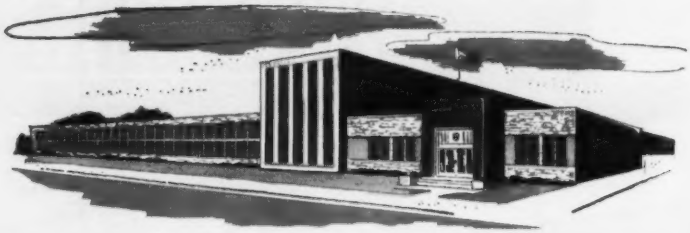
REPUBLIC STEEL

213 East 131st Street
Cleveland 8, Ohio

"Our ALLIS-CHALMERS switchgear

Says:

HENRY KLINGBEIL,
Plant Engineer
GIDDINGS & LEWIS



And he should know! He helped with the planning and he was on hand during the installation.

The problem: to tear out the old switchgear, install three new switchgear lineups plus one control lineup — and have the plant ready to go when the two-week vacation shutdown was over.

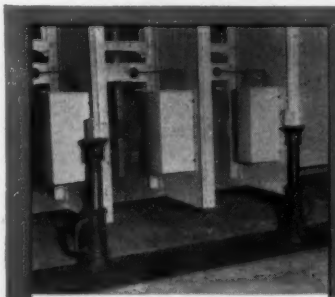
Months of careful planning and scheduling went into the job. In addition, these features of Allis-Chalmers Switchgear helped Giddings & Lewis, and their contractor, meet this tight schedule:

- Special arrangements for jacking structure.
- Jig-built stationary and removable elements that assure interchangeability.
- Swing-out type potheads to simplify cable connections.
- Dry-type bus joints eliminate compounds.
- Open-ended bus compartment that makes it possible to slide cubicles into place without lifting them over the floor cable.

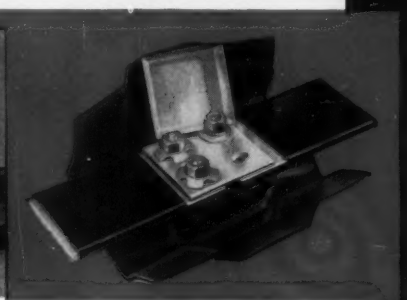
Perhaps you have an electrical modernization problem and must think in terms of fast changeover.

If so, Allis-Chalmers has two things to offer: (1) Switchgear features that make installation fast and easy; and (2) close cooperation at every stage of the job.

Call your nearby Allis-Chalmers office early in the planning stage. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



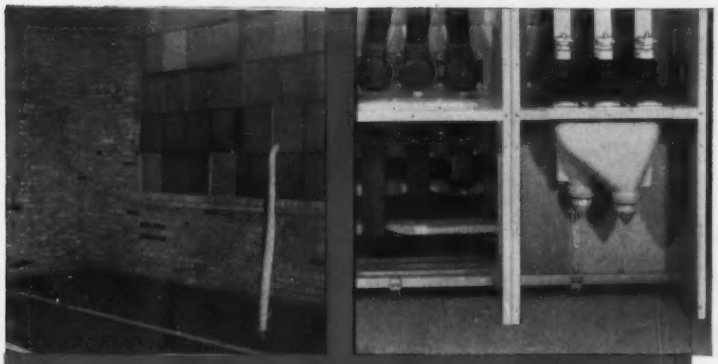
Cubicles were placed on rollers and moved into place at Giddings & Lewis. Here is simple jacking arrangement that makes lifting cubicles easy.



This dry-type bus joint, originated by A-C, speeds the job, allows expansion or contraction of bus. There's no fuss, no muss, no messy compounds.

ALLIS-

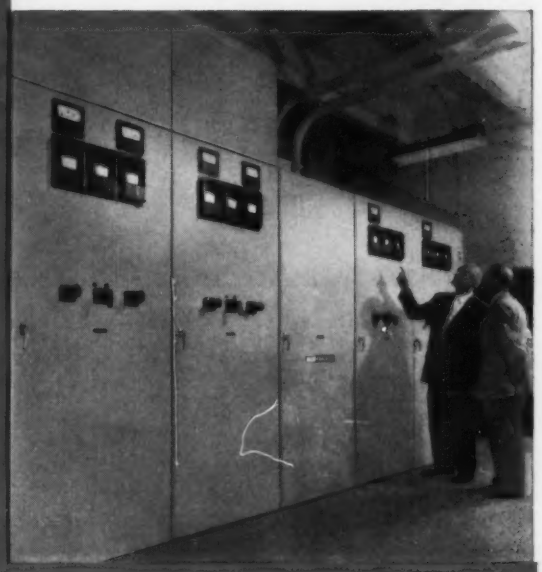
went in fast, without a hitch..."



Giddings & Lewis had floor cable in place before switchgear arrived, as in photo at left.

Placing Allis-Chalmers switchgear over floor cable, as in photo at left, is a simple operation. It can be done without lifting cubicles. Rear of cubicle has no cross member at floor line, switchgear can be slid into place.

Below, completed installation is being checked by Allis-Chalmers representative, John Gerber, and Henry Klingbeil of Giddings & Lewis.



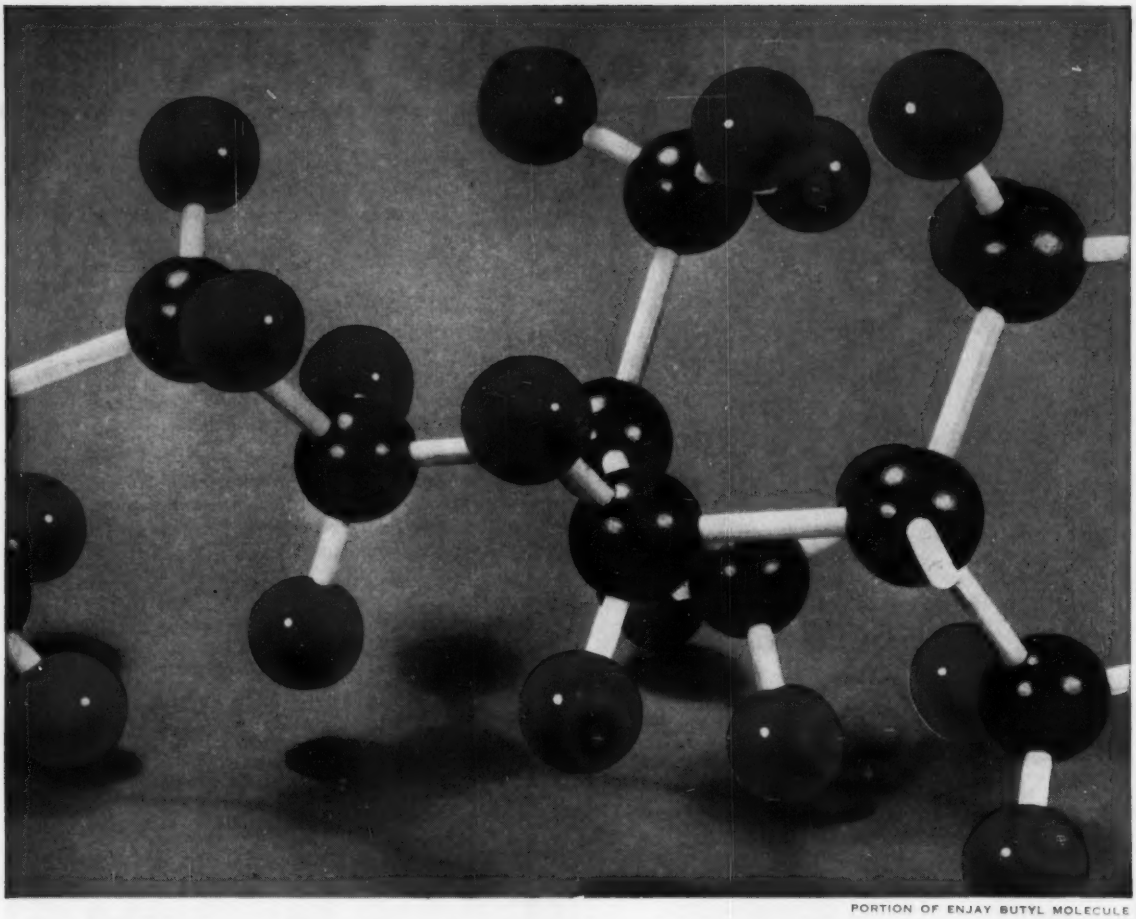
Modern factory-built unit replaced piecemeal arrangement. Since the whole installation is factory engineered and assembled, this in itself speeds installation.

A-4891

CHALMERS

A-C ALLIS-CHALMERS

Get booklets on the All-New Allis-Chalmers Low Voltage Switchgear. Ask for Bulletins 1B8252 and 1B8283.



PORTION OF ENJAY BUTYL MOLECULE

Enjay Butyl—greatest rubber value for electrical application

Enjay Butyl, an amazingly versatile rubber, has opened a whole new field of electrical application. It has proven itself ideal in such varied uses as high voltage cable insulation, casing and insulation for indoor-outdoor transformers, and insulation for underground service cables. The reasons: its long life, low power factor and dielectric properties, stability to temperature change and resistance to heat and aging combined with its outstanding resistance to ozone and corona, superior low-temperature flexibility, and resistance to moisture absorption and abrasion.

- Check these three *outstanding* features of Enjay Butyl: *excellent electrical properties*, a *definite price advantage*, and *immediate availability*.
- Enjay Butyl may have a place in *your* operation. It can cut costs, increase the performance of your product. It will pay you to get all the information on this low-cost rubber. The complete laboratory facilities and skilled technical assistants of the Enjay Company are at your service. Contact them today.

ENJAY BUTYL

Enjay Butyl is the super-durable rubber with outstanding resistance to aging • abrasion tear • chipping • cracking ozone and corona • chemicals gases • heat • cold • sunlight moisture.

ENJAY **ENJAY COMPANY INC., 15 West 51st Street, New York 19, N. Y.**
District Office: 11 South Portage Path, Akron 3, Ohio.

36 SUCCESSFUL YEARS OF LEADERSHIP IN SERVING INDUSTRY

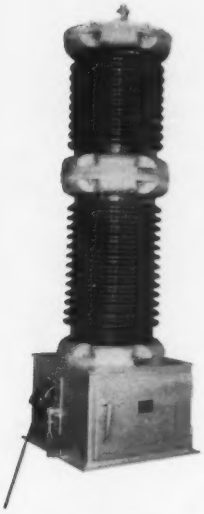
Armor Rod Tool

(*Continued from page* 150)

deforming the rods, the manufacturer reports. The tools are available in sizes for 6 to 4/0 AWG and 6 to 666.6 Mcm ACSR.

A holding tool (not illustrated) enables one man using one hot-stick to exercise positive control over the assembly and to position the two tools and rods on the conductor.

James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.



Coupling Capacitor

A carrier-current coupling capacitor (Type PC-3) having high capacitance features mechanical strength and ease of tuning. The unit, rated from 46 to 345 kv, provides a low-loss path for broad-band coupling of carrier signals to h-v transmission lines.

The capacitor is also available with a Class A potential device providing a source of low voltage power for relaying functions.

Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.

Non-Slip Differential

Trucking operations are simplified in ice, snow, gravel, mud, sand, soft ground or other adverse driving conditions with the help of a non-slip differential. The mechanism is now available as factory-installed equipment on a line of half-ton trucks.

The non-slip differential is claimed to eliminate virtually all slipping and spinning. It transmits up to 80% of the power to the wheel which has traction.

Manufacturer reports that, besides safety and operating economies, the new differential offers maintenance advantages. Tire wear is said to be reduced because the differential eliminates wheel hopping on rough surfaces and turns and does away with useless wheel spinning. Also, wear on gears in the drive train is reportedly reduced.

Studebaker-Packard Corp, Studebaker Division, South Bend, Ind.

MORE NEW PRODUCTS

Electric Cord Co, 195 William St, New York 38, N. Y., has an **explosion-proof lighting unit** that provides automatic emergency illumination. The unit can support 5 heads and is furnished with a 6-v, 60-amp-hr nickel-cadmium battery.

Harvey Hubbell, Inc, Bridgeport, Conn., has a surface-type **power outlet** that measures 1.296 in. from mounting plate to base. It is designed to fit minimum-size single-gang box without touching sides.

Erico Products, Inc, 2070 E. 61st Place, Cleveland 3, Ohio, has added two models to its line of **toggle clamps.** The VQ-1 is rated 1,000 lb vertical clamping pressure while VQ-2 is rated 2,000 lb.

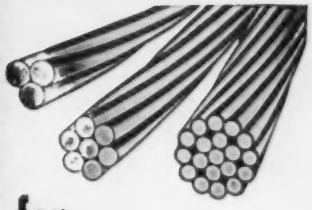
Maintenance, Inc, Wooster, Ohio, has an all-purpose **black coating** for protecting wood, metal or concrete. The paint (J-41-B) is said not to crack, check, chip, flake or peel.

Radio Frequency Co, Medfield, Mass., has a line of **induction heaters** for applications such as high temperature (1900F) brazing or rapid brazing, soldering or hardening of parts without affecting nearby sections.

Knopp, Inc, 4236 Holden St, Oakland 8, Calif., has a **phase shifter** (Type Q-1) for testing watthour meters, power-factor indicators, and similar equipment. Rated 450 va, it can be supplied in other ratings.

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

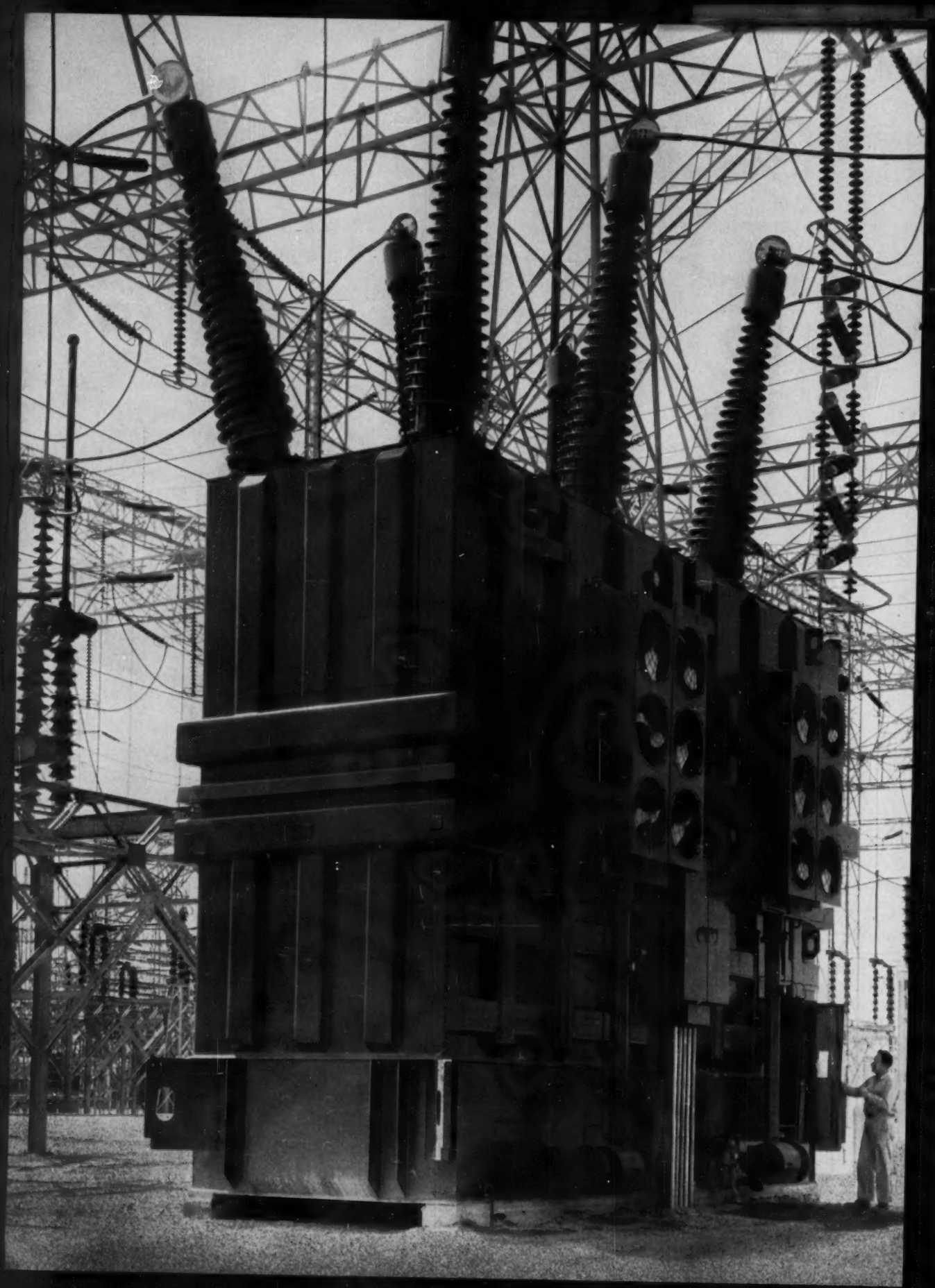
PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

ACCO Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

for Better Value



World's largest at 400,000 kva...

greatest transformer capacity ever applied to a transmission system

News was made recently with the installation of the world's largest autotransformer at the Tanners Creek plant of the Indiana & Michigan Electric Co., Lawrenceburg, Indiana. This 330-kv unit and another identical twin, both built by Westinghouse, are the only transformers of this enormous capacity ever operated on a transmission system.

One glance will show you the giant proportions of this transformer compared with the man in the foreground—33 feet high from base to bushing tip, 30 feet long, 16 feet wide, and weighing 574,000 pounds oil-filled. Despite the literal immensity of the transformer, it is the Westinghouse Form-Fit design with forced-oil cooling which made it practical to construct and ship this 3-phase unit—a new achievement in power conversion for the electric utility industry.

With the development of this new capability in transformers, it is still a fact that Westinghouse Form-Fit transformer design provides minimum bulk consistent with low losses, offering you maximum year-in and year-out operating economy and over-all performance you can depend on.

For more particulars, get in touch with your Westinghouse Sales Engineer, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70756

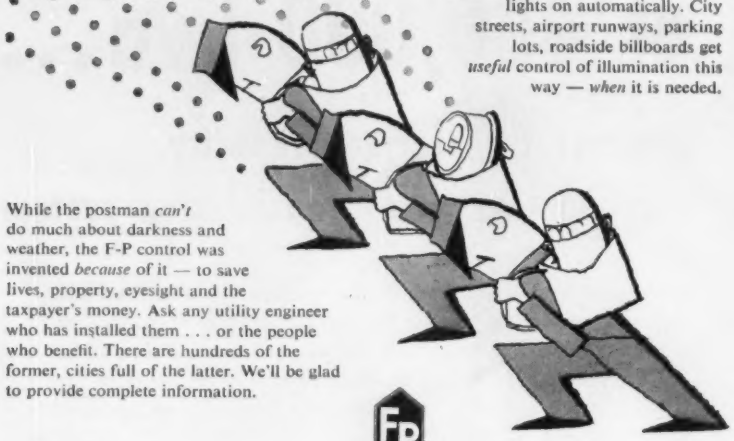
The greatest concentration of power conversion equipment ever applied to a 330-kv system is shown here at the Tanners Creek plant of the Indiana & Michigan Electric Co.

YOU CAN BE SURE...IF IT'S

Westinghouse

neither snow nor rain, nor heat nor gloom of night...

... can keep the dependable postman — or a Fisher-Pierce photoelectric lighting control — from "completing the rounds." Whether it gets dark at 3 o'clock in the afternoon or 8 at night . . . in any season and in any weather (as long as there's power) — F-P controls switch lights on automatically. City streets, airport runways, parking lots, roadside billboards get *useful* control of illumination this way — *when* it is needed.



While the postman *can't* do much about darkness and weather, the F-P control was invented *because* of it — to save lives, property, eyesight and the taxpayer's money. Ask any utility engineer who has installed them . . . or the people who benefit. There are hundreds of the former, cities full of the latter. We'll be glad to provide complete information.

THE FISHER-PIERCE COMPANY, INC.
82 Pearl Street, So. Braintree, Boston 85, Mass.

EXPORT:
Philips Export Corp., 100 E. 42nd Street, New York 17, N. Y.
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Northern Electric Co., Ltd.

Power...

to make dreams come true

From Fantasyland to Tomorrowland, Marcus Transformers provide trouble-free, uninterrupted service in Disneyland—fun capital of the world. Your business, too, can profit by using the transformers that are setting new standards for the industry. For transformers that exceed specifications, order—*MARCUS.*

A complete line of dry type and liquid-filled transformers through 5000 KVA.

MARCUS
TRANSFORMER CO., Inc.

MTC

RAHWAY, NEW JERSEY

"Mark of Quality"

Representatives in Principal Cities

CATALOGS—BULLETINS

● **SILICONE TUBING:** Silicone flexible tubing and sleeving, rubber or resin-coated, are described in 4-page Folder No. 30. Tables cover minimum performance specifications, colors, packaging and wall thickness, and telescoping. Suflex Corp, 33-40 57th St, Woodside 77, N. Y.

● **CORROSION RESISTANCE:** A 4-page booklet describes a process for increasing the heat, wear and corrosion resistance of ferrous and certain non-ferrous metals. The process, known as Chromallizing, employs high temperature diffusion of chromium into the surface of the metal. Chromalloy Corp, 450 Tarrytown Road, White Plains, N. Y.

● **BUSWAY:** Following publications are available from General Electric Co, Distribution Assemblies Department, Plainville, Conn.:

High-reactance busway (Type CL), designed for commercial and industrial use, is described in 8-page Bulletin No. GEA-6469. The busway is available in 1,000 to 4,000-amp ratings, 3-phase, or 3-phase, 4-wire construction. Booklet includes ratings, weights, dimensions, installation data, and guide form specifications.

Plug-in busway (Type FVK Flex-A-Power) is subject of 20-page Bulletin No. GEA-6470 which covers construction, application, ratings, weights, dimensions, installation data, and guide form specifications. The busway, which permits direct connection to bus bars in commercial and industrial applications, is designed for 225 to 1,000-amp, 600-v secondary feeder systems.

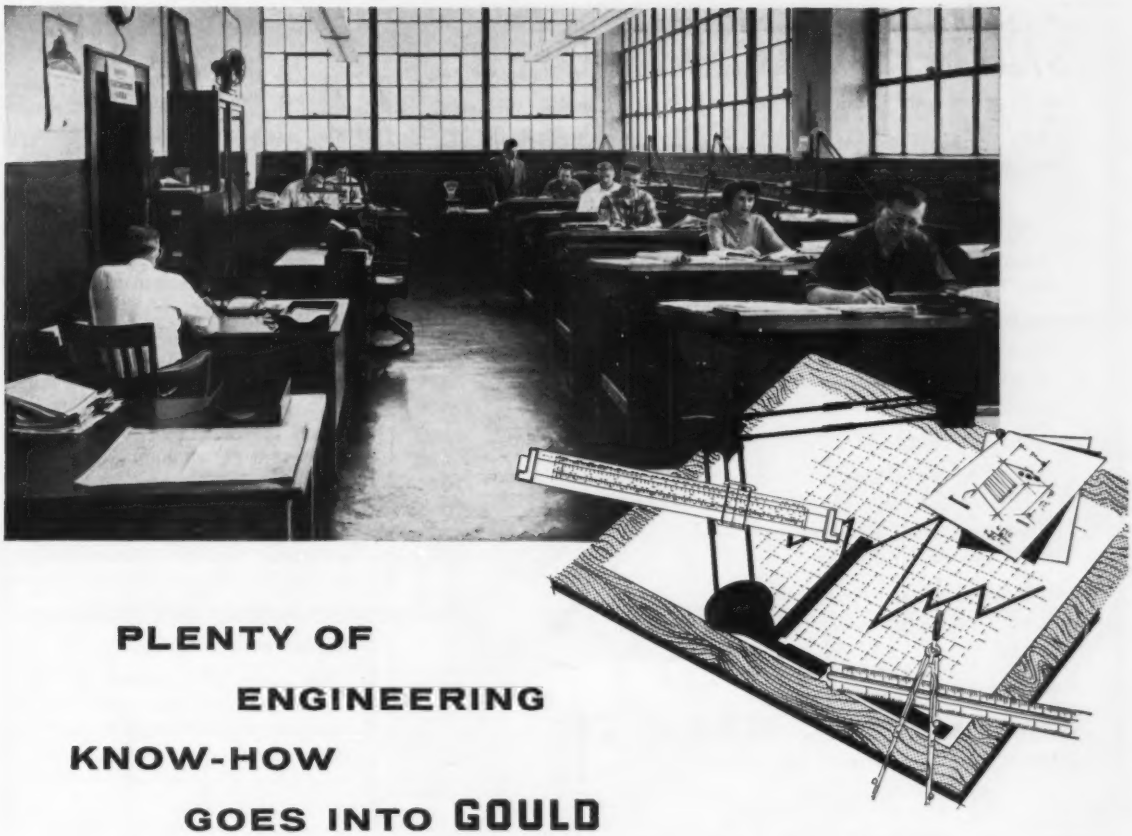
● **LIQUID-FILLED TRANSFORMERS:** Transformers with Chlorextol fireproof insulating liquid for safe indoor installations are described in 4-page Bulletin No. 61B6043C. The transformers, depending on application, are available in ratings from 3 to 15,000 kva, 46 kv and below. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

● **ELEVATING LADDER:** Operating features of a mechanical elevating ladder (Series 2200) are covered with aid of illustrations and diagrams in a 4-page folder. Chart shows ground-to-platform heights for elevations from 12 to 72 deg. J. H. Holan Corp, 4100 W. 150th St, Cleveland 11, Ohio.

● **DIRECTORY:** Product literature directory gives an alphabetical description of company products and their descriptive literature. The 24-page Bulletin No. B6057 also lists the firm's plants and sales offices. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

● **FIRE PROTECTION:** Bulletin No. 73 (26 pages) covers methods of fire prevention, detection, extinguishment, and control for power plants and industry. Photographs, charts, and tables included. Automatic Sprinkler Corp of America, Youngstown 1, Ohio.

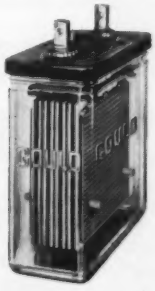
● **POLYETHYLENE RESINS:** Petrothene polyethylene resins are described in a 14-page illustrated brochure which covers properties, applications, manufacturing, and processing. Tables deal with 300 Series electrical grade resins and electrical, thermal and chemical resistance of polyethylene. U. S. Industrial Chemicals Co, 99 Park Ave, New York 16, N. Y.



PLENTY OF ENGINEERING KNOW-HOW GOES INTO GOULD RESEARCH BUILT BATTERIES!

On the drawing boards in the Gould engineering department, theory is made practical. Drawings and specification charts indicate the right plate size, battery case size, the eventual battery capacity, how grids should be cast, how active material should be mixed and how the battery should be constructed—to make sure you get the right battery for the right job!

One more reason why you get better batteries first from Gould!



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GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

Always Use Gould-National Automobile and Truck Batteries

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For Precise and Rapid Measurements of

- **Magnetic Design**
  Steady readings accurate to ± 0.5% at any part of any scale.
- **Instantaneous Reading**
  No timing or waiting.
- **Self-Powered**
  Needs no battery. Always ready for immediate use at full accuracy.

Nine Ranges. To 50,000 rpm on highest. Interpolate tenths of rpm on lowest.

Overspeed Protection inherent and built-in.

Hold Button "memorizes" reading when desired.

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SURFACE SPEEDS
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Complete Service Facilities

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PAGE chain link FENCE

America's First Wire Fence—since 1883

• When you think of hazards at your properties, think of PAGE. And when you think of protection against hazards, think again of PAGE. Whether you choose heavily galvanized Copper-Bearing Steel, corrosion-resisting Aluminum, or long-lasting Stainless Steel, PAGE Fence is quality controlled from raw metal to rugged fence erected on metal posts deep-set in concrete. Available are 8 basic styles, varied by heights, types of gates, top rails, and barbed wire strands for added security. Finally your PAGE Fence will be expertly erected by a reliable, technically trained firm. For important fence data and name of nearest PAGE firm—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

Tries AAAC Primaries

(*Continued from page* 83)

psi in the steel strand at 1% extension and about 25,000 psi in the six EC aluminum strands, develops an average tensile strength of 45,700 psi in the composite cable.

Eliminating the steel core with its magnetic losses drops the ac resistance of the new conductor almost to the dc value, unlike 6/1 ACSR which shows a ratio of 1.25 at full load in the 4/0 equivalent size. When the cross-section of the alloy conductor is increased to compensate for its deficiency in volume conductivity, compared with EC aluminum, its OD becomes practically identical with that of 6/1 ACSR. Its ability to dissipate heat thus remains the same so that the 20% reduction in ac resistance permits about 10% more current for the same conductor temperature.

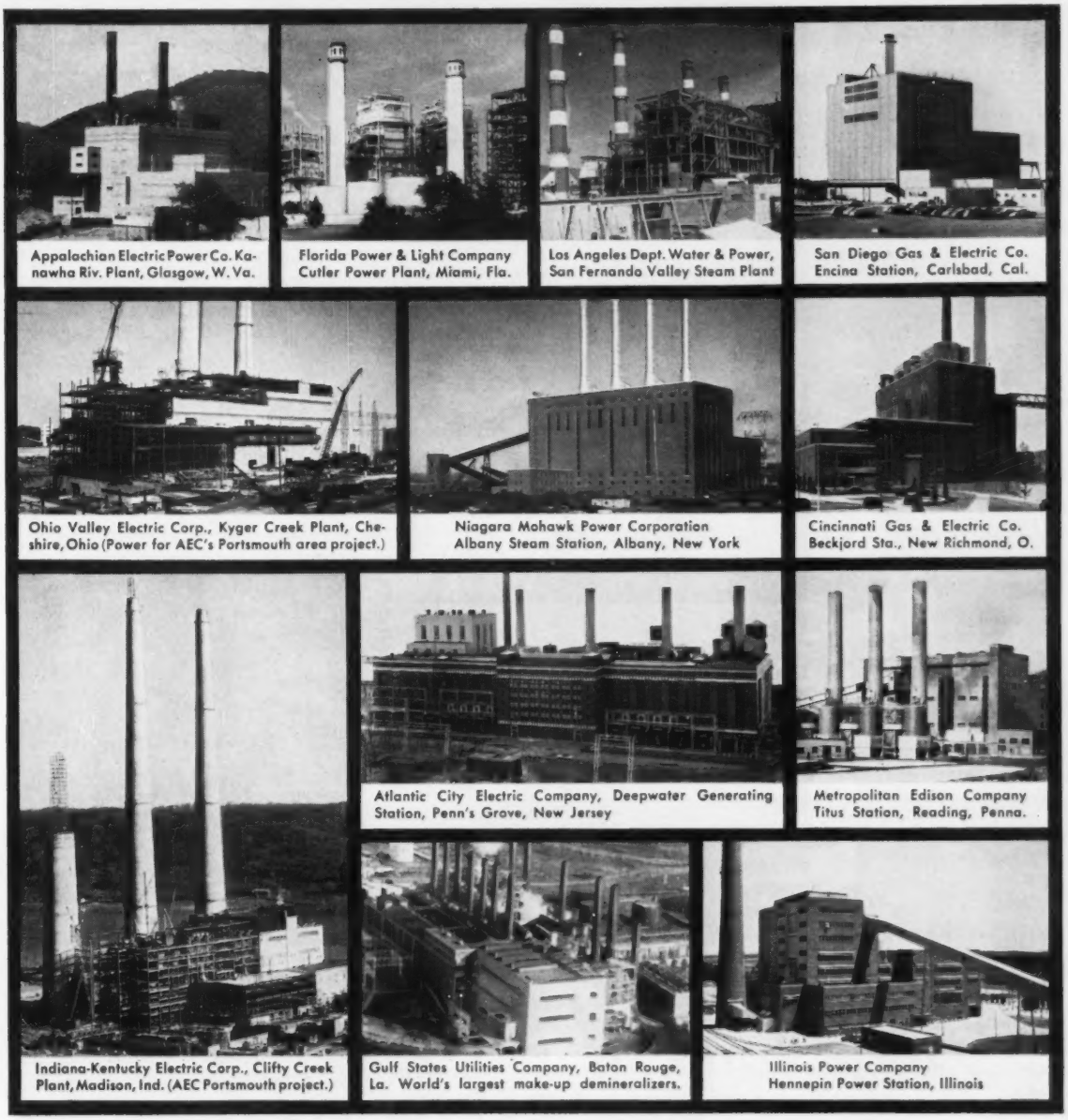
Costs Favor AAAC

Moreover, high temperature from an electrical overload causes less impairment of tensile strength than in an EC aluminum cable. AAAC is drawn from alloy which is heat-treated at a much higher temperature than would be expected in service while strain-hardened EC aluminum suffers slow but progressive loss of strength at temperatures over 150C.

Incomplete installation figures for the trial lines indicate that they may cost somewhat less than equivalent ACSR. Operating experience has been favorable, and additional installations are contemplated. These will reflect the results of continuing search for new economies offered by use of the new conductor material.

Washington Plans Code

A new code for electric utility line construction for Washington State, to be patterned after the National Electric Code of the Bureau of Standards, will soon be presented for public hearings throughout the state, upon completion by a group of electrical industry representatives. The new code, which will be introduced before the 1957 legislature, would replace a code that has been in effect for 42 years but which is now outdated because of the development of the coaxial cable and television.



Appalachian Electric Power Co. Kanawha Riv. Plant, Glasgow, W. Va.

Florida Power & Light Company Cutler Power Plant, Miami, Fla.

Los Angeles Dept. Water & Power, San Fernando Valley Steam Plant

San Diego Gas & Electric Co. Encina Station, Carlsbad, Cal.

Ohio Valley Electric Corp., Kyger Creek Plant, Cheshire, Ohio (Power for AEC's Portsmouth area project.)

Niagara Mohawk Power Corporation Albany Steam Station, Albany, New York

Cincinnati Gas & Electric Co. Beckjord Sta., New Richmond, O.

Atlantic City Electric Company, Deepwater Generating Station, Penn's Grove, New Jersey

Metropolitan Edison Company Titus Station, Reading, Penna.

Indiana-Kentucky Electric Corp., Clifty Creek Plant, Madison, Ind. (AEC Portsmouth project.)

Gulf States Utilities Company, Baton Rouge, La. World's largest make-up demineralizers.

Illinois Power Company Hennepin Power Station, Illinois

Why these power plants chose PERMUTIT® *water conditioning:*

Some chose Permutit for its world-known engineering experience in thousands of utilities and industrial power plants . . . covering every major development in water conditioning from the first zeolite water softeners to the most modern demineralizing systems.

Others chose Permutit for its complete, integrated service: the water-analysis labs, engineering, equipment, controls and ion exchange resins . . . from one source . . . under one responsibility.

But most of the designers of these plants chose Permutit because they have personal knowledge of many installations where Permutit equipment has given long years of efficient, trouble-free performance. They know that's what pays off in the long run.

The Permutit Company, Dept. EW-3, 330 West 42nd St., New York 36, N. Y.

DEMINERALIZERS • ZEOLITE AND HOT PROCESS SOFTENERS • PRECIPITATORS • DEAERATING HEATERS • PRESSURE AND GRAVITY FILTERS • CHEMICAL FEEDERS • AERATORS • BLOW-OFF EQUIPMENT AND OTHER POWER PLANT SPECIALTIES.

Sangamo's AD-5 Meter Adaptable for H-V Lines

Here is being demonstrated a hot-stick resetting of Sangamo's new AD-5 thermal ampere demand meter during a test in the laboratory. Herbert Johnson, chief engineer, (with hot stick) is showing the operation to C. L. Drummond, executive engineer, both of Sangamo Electric Co.

The new meter is adapted for installation directly in series with high-voltage lines. It is located as "live" equipment. The adaptation includes a mounting socket to fit standard insulators and a gravity return reset device which can be operated readily by a "hot stick."

The AD-5 is designed to measure current on distribution primary circuits without requiring a separate transformer. This meter is intended for connection into delta circuits and, in some cases, into the h-v side of wye-connected polyphase distribution transformers where the neutral is not accessible for type ADN meter.

Standards Bureau Offers Data Service on Tubes

National Bureau of Standards has established a tube information service for accumulating and disseminating technical data on domestic and foreign radio tubes.

With this service it is possible to find: Information about any tube; all tube types whose characteristics, size or configuration fall within particular ranges; and domestic tubes that can be substituted for unavailable foreign tubes.

UL Accepts ACT Cables with Monsanto's Opalon

Cables of the ACT (armored cable, thermoplastic) type have been tested and, for the first time, found acceptable by Underwriters' Laboratories, reports Monsanto Chemical Co. The ACT-type cables were developed by Columbia Cable & Electric Corp, Brooklyn, N.Y., Clifton Conduit, Inc, Jersey City, N.J., and Ettco Wire & Cable Corp, Brooklyn, N.Y. The companies cooperated with Monsanto's Plastic Division at Springfield, Mass.

Each of the cables had conductors insulated with electrical grade Opalon vinyl chloride, a thermoplastic compound. This insulation, Monsanto advises, complies with the Type T requirements of the National Electrical Code.

Martin G. Caine, sales manager of vinyl resins and compounds for Monsanto's Plastic Division, said that UL recognition would help establish armored cable with vinyl insulated conductors as a standard. He continued: "Because of its high durability, vinyl insulation has been used for many years in building wire and other electrical applications. In the armored cable field this durability will be equally important."

Electric Stairway Plant

Westinghouse Electric Corp has acquired a site near Dover, N. J. to erect a multi-million dollar plant for the manufacture of electric stairways. Ground will be broken this spring and the plant is expected to be in operation early in 1957.

S-C to Build Multiplexing for Utility's Microwave

Multiplexing equipment for a 400-mile microwave communication system in Canada will be supplied by Stromberg-Carlson, a division of General Dynamics Corp. S-C recently announced that the equipment for Quebec Hydro Electric Commission's communication system is now being built in S-C's Rochester, N. Y., plant.

The microwave system will connect the Commission's headquarters in Montreal to its two power plants on Bersimis River near Gulf of St. Lawrence. It will provide more than 30 circuits for voice communication, teletype, telemetering, and load frequency control. This gives centralized control over nearly two-million horsepower. All power information will be indicated and recorded in the Commission's central control room.

Multiplexing is the process of "scrambling" a number of radio signals, sending them simultaneously on the same channel, and "unscrambling" them at the receiving end. It can be applied to voice, teletype, telegraph, or radio signals.

(*More M & M on page* 164)

NEW! Heavy-duty relay in small space

This new CLARK Type "PM" Control Relay introduces a new concept in relay design: *Sectional Pole Construction.*

In this new relay, each pole is contained in its own melamine housing, and any individual pole can be removed or replaced from the front without disturbing the others. A short circuit is confined to a single pole and will not destroy the whole relay. Wiring terminals are on the front, and all maintenance including coil changing, pole or magnet replacement, is also from the front—without removing relay from panel. Contacts are quickly and easily convertible from normally open to normally closed and vice versa—from the front. Range of models provides relays with 2 to 12 poles. Exclusive design allows more contacts per square foot of panel space. In addition to the many advantages of SECTIONAL POLE CONSTRUCTION, you get a *heavy-duty relay in small space.*

For complete information write to

The CLARK CONTROLLER *Company*

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA...CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

HANDY ANDY SAYS,

DUXSEAL®
plugs 'em quick and tight

DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

JM

Johns-Manville
SEALING COMPOUNDS

Fiber-Glass Poles Installed in Michigan

Here linemen of Consumers Power Co are moving a fiber-glass pole and crossarm at an installation in Alma, Mich. This test installation consists of a group of eleven 35-ft poles. Each pole is fabricated of epoxy resin fiber glass, is hollow and has 0.1-in. wall thickness. (See p 79)

Utility poles and crossarms of this construction have been developed by Gar Wood Industries, Inc. These items and other line products of fiber glass will be distributed by Line Material Co. (EW, Feb. 20, p 99)

Okonite Purchases Plant for Cable Manufacturing

Okonite Co, Passaic, N. J., has purchased a 160-acre property near New Brunswick for $4,205,000, advises Albert F. Metz, board chairman.

The buildings have 430,000-sq ft area and will be used for cable manufacturing. Okonite expects to start occupying the facilities in three months and will eventually employ more than 1,000 persons, Metz stated.

Okonite purchased the plant from Volkswagen of America, Inc, a German automobile manufacturing company which had planned to produce Volkswagen cars but abandoned the idea. Volkswagen bought the plant last November from Studebaker-Packard Corp.

Anaconda Plans Boost of Chile Copper Output

Anaconda Co recently aired plans to spend an estimated $53 million for mining copper ores in Chile. The company's subsidiary, Andes Copper Mining Co, expects that four to five years will be required to bring into production the ores of Indio Muerto Mountain district. Andes Copper estimated annual output at about 100,000 tons of fine copper.

Anaconda also announced that another subsidiary, Chile Exploration Co, is proposing to build and equip a plant to recover molybdenum as a by-product operation of copper production at Chuquicamata, Chile.

Eagle Acquires 4th Plant, Purchases Capitol Wire

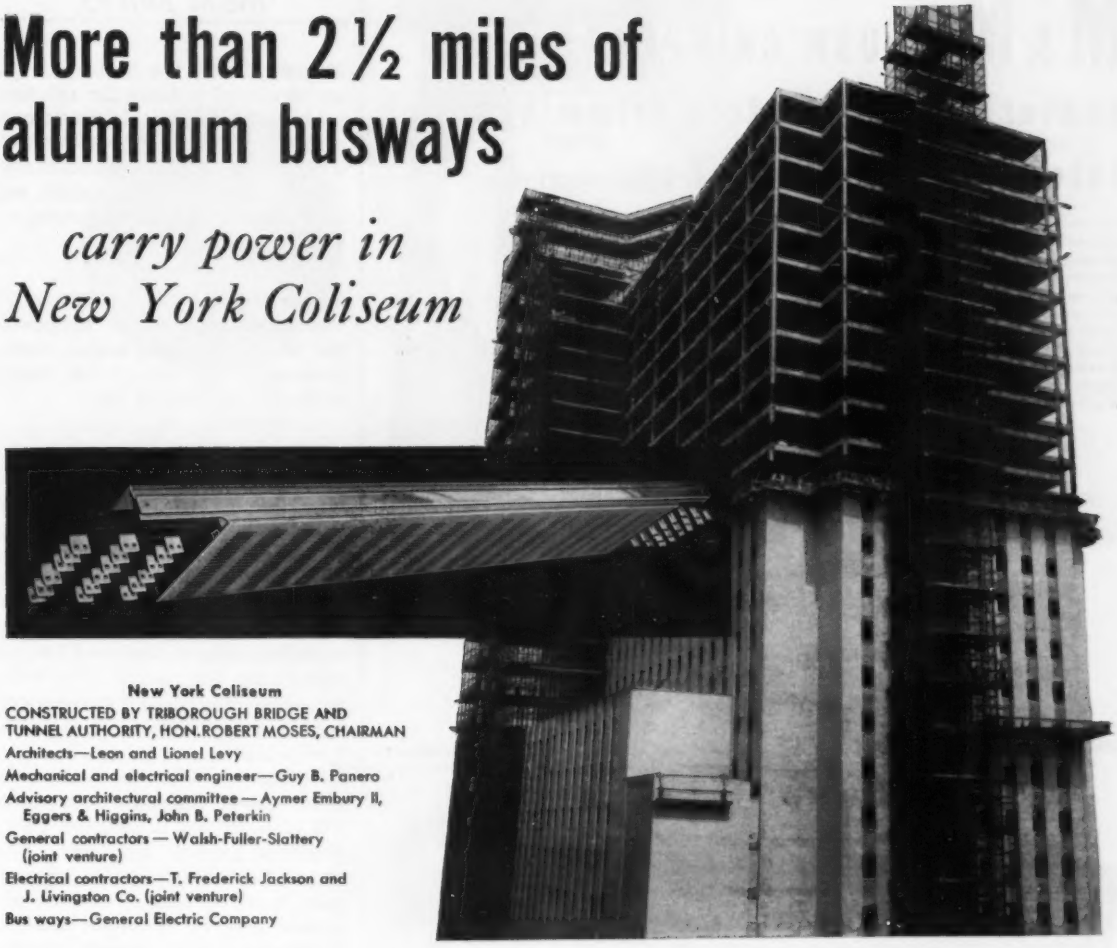
Eagle Electric Mfg Co, Long Island City, N.Y., has acquired a building for a fourth plant, to produce its line of wiring devices for home and industry use. This Astoria, N. Y., structure will provide 125,000 sq ft of manufacturing and warehousing space, for a total of over 400,000 sq ft.

Also, Eagle has purchased all the physical assets of Capitol Wire & Cable Co, Brooklyn, N.Y. The equipment, mostly wire drawing machines, has been moved to the newly acquired building and is expected to be in operation in a few months.

(*M &M Briefs on page* 166)

More than 2½ miles of aluminum busways

carry power in New York Coliseum



New York Coliseum
CONSTRUCTED BY TRIBOROUGH BRIDGE AND TUNNEL AUTHORITY, HON. ROBERT MOSES, CHAIRMAN
Architects—Leon and Lionel Levy
Mechanical and electrical engineer—Guy B. Panero
Advisory architectural committee—Aymer Embury II, Eggers & Higgins, John B. Peterkin
General contractors—Walsh-Fuller-Slattery (joint venture)
Electrical contractors—T. Frederick Jackson and J. Livingston Co. (joint venture)
Bus ways—General Electric Company

Important Innovations in Coliseum

New York City's new Coliseum is modern in every detail, particularly in its electrical distribution system. This 26-story office building, combined with 365,000 square feet of display space, has one of the first major installations of a higher voltage distribution system (480Y/277 volts). More than 2½ miles of bus way incorporating aluminum conductors were used to feed power to this huge structure.

Higher Voltage System Saves Money

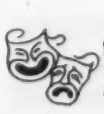
The higher voltage system provides greater capacity and flexibility than conventional systems. Yet it requires only half as many, or half as large, risers and feeders. Characteristics such as excessive voltage drop or costly power losses present no problems to this system. The use of lightweight aluminum bus bars makes the equipment easier to handle and easier to install.

More and more manufacturers of packaged electrical distribution systems are finding that Alcoa® Aluminum Bus Conductor offers advantages of lower cost, availability, design flexibility. Aluminum distribution bus weighs a third less than a copper system of equal conductivity. Pound for pound, it has greater current-carrying capacity than cable in conduit.

Alcoa Aluminum Is Your Best Bet, Too

Wherever your production requirements demand an efficient, flexible electrical distribution system, it will pay you to specify bus ways with Alcoa Aluminum Conductors. Write us for the names of manufacturers who specialize in this lighter, better, more economical product. Aluminum Company of America, 2306-C Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

M&M BRUSH CHIPPERS

convert 3000 lbs. tree trimmings into small chips in 1 hour

A portable, highly efficient unit with its own power plant, the M & M Brush Chipper converts a truckload of useless brush into a small pile of chips in 21 minutes. The chips make excellent fuel, and can also be used for livestock bedding or mulch. The M & M Brush Grinder will handle branches (green or dry) up to six inches in diameter, and will deposit them in a truck or container or in a neat pile on the ground. The M & M Brush Grinder has a standard trailer hitch for towing behind car, jeep, or truck, and a retractable wheeled jack for levelling when detached from towing vehicle. Moving parts are fully enclosed for safety, and the whole unit is ruggedly constructed for long, hard service. Write today for illustrated folder.

MITTS & MERRILL 1002 South Water Street • SAGINAW, MICHIGAN

94

Meter Installations *A Cinch!*

with KEES SOCKET CINCHER

Kees Socket Cincher saves time and tempers by simplifying socket meter installations . . . eliminates pounding and danger of breakage to glass covers.

With Kees Socket Cincher, you secure the meter into the base firmly and quickly merely by snapping the locking device into position.

A must on every service truck. Reasonably priced at only $2.50 each F.O.B. factory. Subject to freight allowance.

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"Since 1874"

KEES

F. D. KEES MFG. CO.
BEATRICE NEBRASKA

M&M BRIEFS

Moloney Electric Co, St. Louis, Mo., has developed a device for selecting production run electronic transformer cores. The "hydro core selectometer" is an eight-in. dial that automatically shows catalogue number, weight, net price and dimensions corresponding to selected core area.

Square D Co started production of switchboards and related equipment late last month at its newest manufacturing facility in Royal Oak, Mich., (EW, Sept 12, 1955, p 59).

General Electric Co developments:

• GE has several new-type turbine-generator units slated for delivery this year. They include: 125,000-kw supercritical pressure (4,500 psi) turbine for Ohio Power Co's Philo Station; a 210,000-kw conductor-cooled generator with liquid-cooled armature for Eastlake Station of Cleveland Electric Illuminating Co; and a 225,000-kw automatic extraction turbine-generator for Public Service Electric & Gas Co's Linden Station.

• Headquarters for the company's atomic power equipment department will be established in San Jose, Calif. The unit employs more than 500 persons and is now located in Schenectady, N. Y. The department was organized in 1955 to design, develop, manufacture and market atomic equipment for commercial uses.

Bogue Electric Mfg Co recently received an order from Consolidated Edison Co of New York, Inc, covering water-treating equipment for Astoria Station. This will double the 100,000-lb per hour capacity of the existing units, according to Bogue.

Armour Research Foundation of Illinois Institute of Technology, Chicago, has a $5 million building program, advised Dr. Haldon A. Leedy, Foundation vice president and director. New buildings include: $1.25 million Physics and Electrical Engineering Research, now under construction and to be completed in 1956; $1.5 million Chemistry Research, completion in 1959; $1.4 million Administration, completion in 1966; additions to Mechanical Engineering Research and Metals, completion in 1961.

To executives of all public utilities:

GET YOUR FREE COPY OF THIS NEW BOOKLET

"New Horizons In Public Service"

This new 40-page, illustrated booklet presents a comprehensive demonstration of the most modern business methods, machines and record systems...*in actual operation*...in one of America's oldest and most outstanding Public Utilities. Don't miss the detailed story showing how this great utility was completely revitalized... how efficient record controls have been proved in use... how its customers are now provided with the *finest and most modern, convenient, economical, friendly and dependable SERVICE.*

Today, every forward-looking utility executive recognizes that *customer satisfaction and service* are its most powerful selling tools. In this book is detailed how this established utility reorganized its procedures... moved into a large new building in a rapidly expanding metropolitan area... continued "business as usual" while improving service to old customers and extending services to thousands of new ones!

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Remington Rand
DIVISION OF SPERRY RAND CORPORATION

The instrument that put electronics to work

Before electronics came into the picture, industrial instrumentation was caught in a squeeze. On one hand, it was besieged with demands by production men and engineers for higher sensitivity, faster speeds, and greater reliability. And on the other hand, it was hampered by the limitations of mechanical devices. For the instruments of fourteen years ago were merely mechanical imitations of a man watching a galvanometer needle and twiddling dials. They were too delicate . . . too sensitive to vibration . . . too easily led astray by wear or maladjustment. They just couldn't deliver the performance that new production methods required.

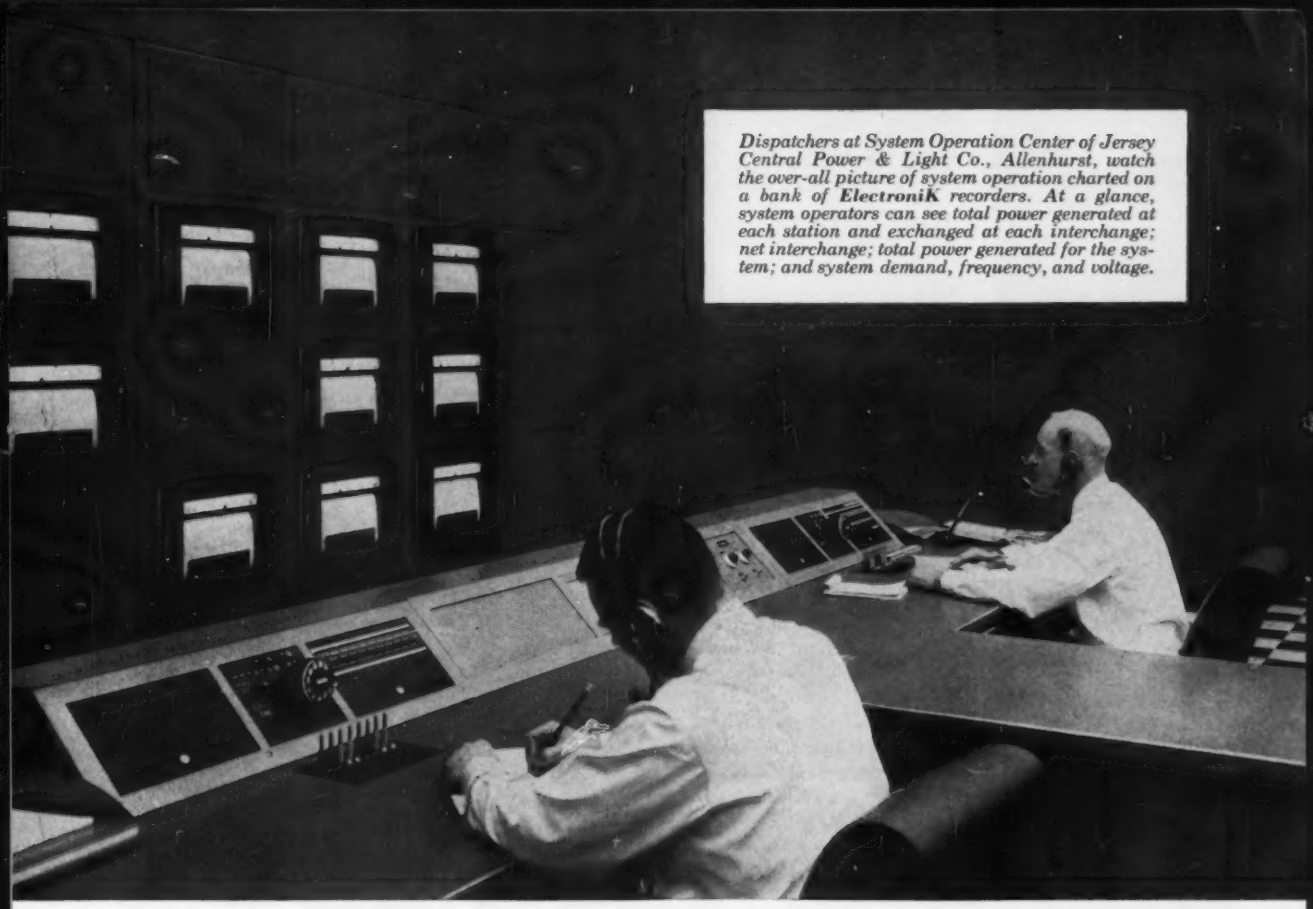
In 1940, however, came a major milestone in the progress of instrumentation—development of the *ElectroniK* potentiometer. This was not only a new kind of instrument. It was a new concept of measurement. For the first time, it applied the science of electronics in a practical way to the design of a measuring device for industry. It replaced complicated, fragile mechanical gadgets with a simple but sensitive electronic circuit and servo system . . . the "Continuous Balance" principle of measurement.

You could tell it was something new when you opened up the *ElectroniK* instrument's case. There was no sign of whirring gears, levers and cams. You could tell it was giving a new kind of performance in measurement, too, by the way the pointer would move swiftly and surely in one smooth sweep whenever the measured variable changed.

The *ElectroniK* instrument gained quick acceptance by production men, engineers, research technicians and maintenance men. They liked the way it provided laboratory accuracy and sensitivity, week after week, under the toughest industrial service conditions. They found that its speed and precision made possible improvements in product quality and process operation that had been unattainable before. And they have proved their confidence by ordering and reordering *ElectroniK* instruments by the thousands . . . not solely because it was *first* of its kind, but because it has continued to be the *best* in performance.

ElectroniK recorders present system data for

CATALOG 1521 *describes and illustrates the complete Honeywell line of ElectroniK recorders and indicators. Send for a copy for your file.*



Dispatchers at System Operation Center of Jersey Central Power & Light Co., Allenhurst, watch the over-all picture of system operation charted on a bank of ***ElectroniK*** *recorders. At a glance, system operators can see total power generated at each station and exchanged at each interchange; net interchange; total power generated for the system; and system demand, frequency, and voltage.*

Jersey Central Power & Light

HERE in this centralized control room, the System Operation Center for Jersey Central Power & Light Co., system operators must make minute-to-minute decisions that carefully balance power generation and interchange against changing demand. And their decisions have to be right to keep over-all operation at peak efficiency and economy.

Reliable, accurate data on load trends is instantly relayed from all points in the system to three banks of *ElectroniK* recorders. High-speed telemetering equipment transmits remote load facts to the recorders in split-second time.

By glancing at one group of *ElectroniK* recorders on the instrument panel, dispatchers quickly see total power generated at each of the system's major generating stations and exchanged at each interchange. These duplex 2-pen instruments simultaneously record both megawatts and megavars on the same chart. Other *ElectroniK* recorders show total system generation, net interchange, system load, system frequency, and voltage at the Raritan River generating station's 115-kv bus.

Versatile *ElectroniK* instruments handle a wide variety of indicating, recording, and control jobs throughout industry. In the power field, too—from generation through distribution—their speed, accuracy, and high dependability pay off in improved system operation. Your local Honeywell sales engineer will be glad to discuss flexible *ElectroniK* instrumentation to fit your specific system requirements. Give him a call . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA:** Write for Data Sheets 9.1-3a, "Wide Chart Power Recorder"; 9.1-8a, "*ElectroniK* Frequency Recorder"; and 10.0-6a, "*ElectroniK* Duplex 2-Pen Recorder."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

VEPCO Elevates Hawkins to VP

James B. Hawkins has been elected vice president of Virginia Electric & Power Co's Eastern Division to succeed the late Robert J. Throckmorton.

Hawkins, who moved up from assistant vice president at Norfolk, was employed by Virginia Public Service Co following graduation in 1926 from Virginia Polytechnic Institute. He held various engineering posts until his 1940 appointment as superintendent of operations in Alexandria. In 1943 he was transferred to Charlottesville as manager of the Blue Ridge district, where he remained after the company's merger into VEPCO in 1944. He was named VEPCO assistant vice president, Eastern Division, in 1952.

J. B. HAWKINS

Ingram, Knapp to Head New Electric Council

Capt Henry A. Ingram, retired naval engineering officer, and Sherman R. Knapp, president of Connecticut Light & Power Co, have been elected executive director and president, respectively, of the recently formed Electric Council of New England.

The council is a regional electric utility association of 48 companies organized to provide a continuous and ready interchange of information on engineering, sales, accounting, area development, and advertising matters.

Other council officers are Western Massachusetts Electric Co Pres Howard J. Cadwell, vice president; and Boston Edison Co's Comptroller Albert J. McNulty, treasurer.

CAPT H. A. INGRAM

S. R. KNAPP

I-T-E Appoints 3 VP's, Division Manager

I-T-E Circuit Breaker Co has promoted William Deans, G. E. Heberlein, and L. H. Lipscomb to new vice presidential posts, and has named F. G. Schmidt manager of the Switchgear Division.

Former vice president of engineering, Deans now becomes vice president. Before joining I-T-E in 1933 as chief engineer, he was chief engineer and general manager of Sundh Electric Co. After graduation from Cornell University in 1913, he served on the faculty at the institution. He later was a member of Thomas A. Edison's personal staff.

Succeeding Deans is Heberlein, Switchgear Division manager since 1950. Before that he was employed by Railway & Industrial Engineering Co, now R&IE Equipment Division of I-T-E, first serving as assistant chief engineer and later as chief engineer.

Lipscomb, new vice president in charge of sales, was previously with Bulldog Electric Products Co, now an I-T-E subsidiary, where he served as field engineer, district office salesman and manager, regional manager, and general sales manager.

Schmidt, manager of the Small Circuit Breaker Division since 1950, succeeds Heberlein.

W. DEANS

G. E. HEBERLEIN

L. H. LIPSCOMB

F. G. SCHMIDT

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- ☐ Strip Heaters
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B-704

A. R. COX

Cox Named San Diego G&E Comptroller

San Diego Gas & Electric Co, in a recent series of executive promotions, has named Arthur R. Cox to the post of comptroller to succeed C. G. Watters, who has retired. Cox formerly served as assistant comptroller and is an assistant treasurer.

Walter A. Zitlau, assistant superintendent of electric production, has been appointed to the newly created management staff position of mechanical engineer. In this post he will assist management in the planning, design, construction, and initial operation of new generating facilities.

Chief design engineer George E. Jenner has transferred to the post of purchases and stores manager, succeeding William deWaard, recently retired. And Joseph F. Sinnott, former system planning engineer, is new chief design engineer.

Rockbestos Ups Becker

New vice president in charge of manufacturing for Rockbestos Products Corp is Paul W. Becker, who joins the firm after serving Electric Auto-Lite Co as manager of its Hazleton, Pa., plant for the past seven years.

A graduate of Hamilton College, Becker joins Rockbestos after 30 years experience in the wire and cable industry. He was formerly employed by General Cable Corp, Anaconda Wire & Cable Co, and Plastic Wire & Cable Co.

P. W. BECKER

Preformed Line Products Elects Bonds Finance VP

Albert Bonds, general manager and treasurer of Preformed Line Products Co since its establishment in 1948, has been elected vice president in charge of finance.

Bonds was previously with American Steel & Wire Co where he served in various capacities, including work in general administrative matters concerning engineering and production.

PERSONAL BRIEFS

Monongahela Power Co's **H. O. Sprinkle,** assistant to the executive vice president, has been named to head a 20-year power supply study for the West Penn Electric Co system, which includes Potomac Edison Co, West Penn Power Co, and Monongahela. The study, to be conducted by committees in each of West Penn's operating companies, will include power supply requirements, future plant sites, and "backbone" transmission lines.

Patrick H. Adams, 47-year veteran of Public Service Electric & Gas Co, N. J., has retired as consulting electrical engineer of the company's electric engineering department.

Iowa Power & Light Co's **George C. Huck** has retired as assistant secretary, assistant treasurer, and transfer agent after 35 years with the company.

Harry R. Burns, manager of general engineering for Cincinnati Gas & Electric Co and Union Light, Heat, & Power Co, Inc, (Ky.) has been granted an extended leave of absence because of health reasons. **Arthur E. Rothenberg** has been named to succeed him.

George A. Spencer is newly appointed Virginia Electric & Power Co assistant treasurer succeeding **Arthur L. Clark** who has been made personnel director. Spencer was auditing and procedure department head.

Public Service Co of Colorado has appointed **Franklin Raglin** superintendent, transportation department following retirement of **Elmer J. Graham.**

Recent San Diego Gas & Electric Co personnel assignments include **Edward J. Wright's** appointment as assistant credit manager, **K. C. Campbell's** promotion to assistant superintendent, electric production department, and appointment of **J. P. Hardway** as Silver Gate station chief.

Personnel appointments following General Electric Co's recent realignment of its large steam turbine-generator department's marketing structure include promotion of **Charles E. Kilbourne** as manager-marketing research and product planning; reappointment of **Charles S. McBride** as manager-advertising and sales promotion; reappointment of **Daniel J. McLane, Jr,** as Manager-sales; and promotion of Gerald A. Parsons as specialist-marketing administration and personnel development. Heading the three newly established marketing components of pricing and contract policy, product service, and the marketing office are **John T. Peters, Thornton W. Howard,** and **Alec C. Elliott,** respectively.

B. W. Bogan, chief engineer since 1950 for Chrysler Corp's Dodge Division, has been named to the newly created post of executive engineer with responsibility for all car and truck engineering activities of the division.

OBITUARY

Samuel R. Bristol, 70, secretary of the Bristol Co until his retirement in 1952, died recently.

Charles A. McClure, 77, secretary-treasurer and counsel for Day & Zimmerman, Philadelphia engineering firm, until his retirement last April, died recently in his Wayne, Pa. home.

This trolley design lowered first costs 30%

This is the 235 ton Powerhouse Gantry Crane built by Paceco for Pacific Power & Light Co., Ebasco Services, Inc., engineers.

Paceco's single trolley design for cranes over 150 ton capacity reduced initial cost 30%-40% below double trolley designs using lifting beam.

Besides economical first cost, the crane has proved low maintenance record. These are Paceco's standards for *every* crane we build. This is why Paceco "tailors" each crane to maximum advantage to the *owner!*

May we harness our nationwide experience-built skills to serve you? We invite your inquiry.

Besides cranes of all types, Paceco designs and builds hoists, high pressure gates and valves; intake gates. May we send you our illustrated brochure on all these products?

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Chance *laminated* Pike Poles are available with tough Maplac plastic coating. Splintering of the wood is eliminated. Lost-time hand injuries, caused by splinters, are avoided.

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CENTRALIA, MISSOURI

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SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co has appointed Donald E. Mowe sales representative for its Washington, D. C., district office.

General Electric Co's Carboloy Department has named Robert J. Mason to succeed E. R. Almdale as manager of the Atlanta district.

Leeds & Northrup Co's recent sales management promotions include Edwin A. Leo's advancement from manager at Pittsburgh to manager of the Chicago office, and Willard H. Neu's promotion from Cincinnati manager to Pittsburgh manager. Manley S. Nolen succeeds Neu; and Thomas C. Bennett, Chicago manager, becomes technical assistant for resale at Philadelphia.

Nordberg Manufacturing Co has announced the following appointments in the sales department of Heavy Machinery Division: H. W. Dow, Jr, has been named special representative of the division to cover diesel engine sales in the New England area; T. J. Angel, St. Louis territory district manager, becomes staff assistant to the division vice president with offices in Milwaukee; and R. P. McBride has been appointed district manager of the St. Louis territory.

Joseph T. Ryerson & Son, Inc, has designated John J. Hauptly acting manager of the inside sales department. Succeeding him as manager of alloy steel sales is Richard L. Smith. Edward J. Byers has been appointed manager of tubular products and cold finished bar sales, succeeding Henry B. Williams, recently promoted to sales manager. Robert F. Philpott is new sales representative for the Ryertex-Glyco department.

Thor Power Tool Co has named three zone managers of Thor electric tool and SpeedTool sales. J. P. Stine becomes east coast zone manager covering New York, Boston, Buffalo, and Newark areas, with headquarters in Newark. New west coast manager is C. B. Baron, who will direct Los Angeles, San Francisco, and Seattle territories, with offices in Los Angeles. And R. J. Burch has been named southeastern manager for Mississippi, Tennessee, Alabama, North Carolina, South Carolina, Georgia, Florida, and portions of Louisiana, with headquarters in Birmingham.

Westinghouse Electric Corp has appointed Harold A. Erickson syndicate representative for lamp division's eastern region sales organization. He succeeds James R. McAlister, now assistant to the region sales manager at Pittsburgh. Carl B. Connell, who recently held that post, has been named Pittsburgh district sales manager.

Weston Electrical Instrument Corp has named John D. MacNamara as field sales manager.

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE IND.

Signs along the lines of *Crapo* GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

INDIANA STEEL & WIRE CO., INC.
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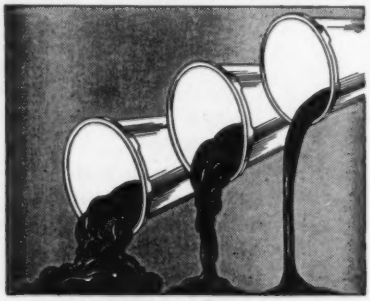
Insulating and Cable-Pulling

COMPOUNDS

of Record-Breaking Performance



Mineralac gives you a complete assortment for every need: dense, viscous and fluid consistencies for high and low voltages in cable-joints, pot-heads, terminal bells, distribution cables, street lighting, telephone work. . . . Insoluble in oil or water, for all temperatures. Clean, safe, economical—outranks all others in quality.

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PAST PERFORMANCE PAYS OFF!

Delaware Power and Light Company selects NEOPRENE-jacketed cables for new sub-station

Neoprene protects cable at Delaware Power & Light Company's modern Basin Road sub-station—built to handle five 69,000 volt line circuits and to act as a 69,000-12,000 KVA transformer bank for one industrial area in Wilmington.

Years of dependable service at other of the company's installations made neoprene the immediate choice when cable jacketing was selected. Experience had proved to DP&L that neoprene's unique properties withstand the host of deteriorating conditions that a cable must undergo.

Rugged and resilient, neoprene resists the attack of weather, abrasion, galvanic action, oil and chemical corrosion. No wonder DP&L feels secure in using neoprene-jacketed cable above or below ground, in ducts and conduits—*anywhere* cable is needed.

Extra-long service life—that's what it adds up to when you specify neoprene jacketing for the cable or wire you buy. And extra-long life means lowered replacement and maintenance costs. Neoprene-jacketed cable is available in single- and multiple-conductor types and in voltage ratings to meet your requirements. Ask your supplier for further details.

MAIL THIS COUPON TODAY!

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MEETINGS CALENDAR

MARCH

SOUTHERN SAFETY CONFERENCE, INC—Southern Safety Conference & Exposition, Hotel Biltmore, Atlanta, Ga., March 4-6.

INSTRUMENT SOCIETY OF AMERICA—6th Annual Conference & Exhibit of Instrumentation for the Iron & Steel Industry, Hotel Webster Hall, Pittsburgh, Pa., March 5-7.

* **AMERICAN SOCIETY FOR TESTING MATERIALS**—Joint Southwest District Meeting with AIEE, Rice Institute, Houston, Texas, March 5; Joint Northern California District Meeting with AIEE, San Francisco, Calif., March 13.

SOUTHEASTERN ELECTRIC EXCHANGE—23rd Annual Conference, Boca Raton, Fla., March 12-14.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—12th Annual Conference, Hotel Statler, New York, March 12-16.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Edgewater Beach Hotel, Chicago, Ill., March 12-16.

AMERICAN INSTITUTE OF INDUSTRIAL ENGINEERS—Fifth Annual Spring Conference, Hotel Cleveland, Cleveland, Ohio, March 15-16.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, Muehlebach Hotel, Kansas City, Mo., March 15-16; Street Lighting Committee, Minneapolis, March 23-24; 22nd Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 26-29.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Spring Meeting, Multnomah Hotel, Portland, Ore., March 18-21.

* **ATOMIC INDUSTRIAL FORUM, INC**—Hotel Plaza, New York City, March 19-20.

INSTITUTE OF RADIO ENGINEERS—Annual National Convention, Waldorf-Astoria Hotel, New York, March 19-22.

* **AMERICAN POWER CONFERENCE**—18th Annual Meeting, Sherman Hotel, Chicago, Ill., March 21-23.

OKLAHOMA UTILITIES ASSOCIATION—Annual Convention, Biltmore Hotel, Oklahoma City, Okla., March 22-23.

PACIFIC COAST ELECTRICAL ASSOCIATION—Engineering & Operating Section, Palace Sheraton Hotel, San Francisco, California, March 22-23.

TENNESSEE VALLEY PUBLIC POWER ASSOCIATION—10th Annual Meeting, Farragut Hotel, Knoxville, Tenn., March 30-31.

APRIL

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—South West District Meeting, Baker Hotel, Dallas, Tex., April 2-4; Special Technical Conference & Exhibit on Magnetic Amplifiers, Hotel Syracuse, Syracuse, N. Y., April 5-6; 8th Conference on Electrical Engineering in the Rubber and Plastics Industries, Mayflower Hotel, Akron, Ohio, April 9-10; Great Lakes District, Fort Wayne, Ind., April 16-18; Technical Conference, Bradford Hotel, Boston, Mass., April 26-27.

INDIANA ELECTRIC ASSOCIATION—16th Annual Young Men's Utility Conference, Hotel Van Orman, Fort Wayne, Ind., April 4-5.

ELECTRICAL MAINTENANCE ENGINEERS ASSOCIATION—8th National Biennial Electric Industry Show, Shrine Exposition Hall, Los Angeles, Calif., April 5-7.

MARYLAND UTILITIES ASSOCIATION—Annual Business Conference, Lord Baltimore Hotel, Baltimore, Md., April 6.

MIDWEST RESEARCH INSTITUTE—Symposium for Management on Applications of Analog Computers, Hotel Phillips, Kansas City, Mo., April 10-11.

POINT OF PURCHASE ADVERTISING INSTITUTE—10th Annual Symposium & Exhibit, Hotel Sheraton Astor, New York City, April 10-12.

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Annual Membership Meeting Ridpath Hotel, Spokane, Wash., April 11-13.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Engineering & Operation Section, Hotel Vancouver, Vancouver, B. C., April 11-13.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operation Section, Bon Air Hotel, Augusta, Ga., April 12-13.

EDISON ELECTRIC INSTITUTE—National Conference of Electric & Gas Utility Accountants, Sponsored jointly with AGA, Hotel Commodore, New York, April 16-18; Industrial Relations Committee, EEI Headquarters, New York City, April 19; Engineering Committees, Edgewater Beach Hotel, Chicago, Ill., April 30-May 2.

GREATER NEW YORK SAFETY COUNCIL—26th Annual Safety Convention & Exposition, Hotel Statler, New York City, April 16-20.

ATOMIC INDUSTRIAL FORUM, INC—Atomic Energy Conference, Atlanta, Ga., & Oak Ridge, Tenn., April 17-19.

PACIFIC COAST ELECTRICAL ASSOCIATION—Administrative Services Section Meeting, Huntington-Sheraton Hotel, Pasadena, Calif., April 18-19.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Engineering Conference, Hotel President, Kansas City, Mo., April 18-20.

PROTECTIVE RELAY ENGINEERS—Ninth Annual Conference, Department of Electrical Engineering, Agricultural and Mechanical College of Texas, College Station, April 23-25.

MAY

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—North Eastern District Meeting, Rochester, New York, May 2-4.

***EDISON ELECTRIC INSTITUTE**—Accident Prevention Committee, Coronado Hotel, St. Louis, Mo., May 2-4; Purchasing & Stores Committee, Sheraton Plaza Hotel, Boston, Mass., May 7-9; Commercial Electric Cooking Conference, Sheraton Hotel, Chicago, Ill., May 8; Transportation Committee Meeting, jointly with AGA, Congress Hotel, Chicago, Ill., May 8-11; Industrial Relations Committee, Willis E. Hughes Memorial, Rochester, N. Y., May 17.

NATIONAL FARM ELECTRIFICATION CONFERENCE—LaSalle Hotel, Chicago, Ill., May 3-4.

AIR-CONDITIONING & REFRIGERATION INSTITUTE—Annual Meeting, The Homestead, Hot Springs, Va., May 7-9.

AMERICAN WELDING SOCIETY—Fourth Welding Show, Memorial Auditorium, Buffalo, N. Y., May 9-11.

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Engineering & Operations Section, Cascadian Hotel, Wenatchee, Washington, May 10-11.

PACIFIC COAST ELECTRICAL ASSOCIATION—Annual Convention, Las Vegas, Nevada, May 14-16.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Design Engineers—Design Engineering Conference, Convention Hall, Philadelphia, Pa., May 14-17.

PENNSYLVANIA ELECTRIC ASSOCIATION—Relay and Electrical Equipment Committees, Hotel Roosevelt, Pittsburgh, Pennsylvania, May 17-18.

INDUSTRIAL HEATING EQUIPMENT ASSOCIATION, INC—Spring Meeting, The Homestead, Hot Springs, Va., May 20-23.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Business Development Section, Benjamin Franklin Hotel, Seattle, Wash., May 21-23.

AMERICAN MANAGEMENT ASSOCIATION—General Management Conference, Hotel Roosevelt, New York City, May 23-25.

CIGRE—16th Annual International Conference, Paris, France, May 30-June 9.

JUNE

***AMERICAN SOCIETY OF REFRIGERATING ENGINEERS**—52nd Annual Meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio, June 4-6.

EDISON ELECTRIC INSTITUTE—24th Annual Convention, Traymore Hotel, Atlantic City, N. J., June 4-6.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS—48th Annual Convention, Ambassador & Chelsea Hotels, Atlantic City, N. J., June 11-14.

PENNSYLVANIA ELECTRIC ASSOCIATION—Electrical & Relay Committees, Hotel William Penn, Pittsburgh, Pa., June 17-18.

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* Additions this week.

THE METER MOUNTING that has made Socket Metering Practical

NOW — No interruption of customers service when testing or replacing meter — eliminates possible damage or annoyance

C200-SE
Closed view.

EXTRA HEAVY DUTY 200 AMP. +

1. **Costs Less** . . . as installation can be made in about one half the time—ample wiring room.
2. **Continuous Service** . . . even while meter is being removed or tested.
3. **Safe** . . . no wires behind the meter to cause shorts or grounds.
4. **Construction** . . . eliminates any chance for water or condensation getting behind meter. Extra knockouts for adding other services, ground conduits, or time clocks.

List Price—$24.70 Painted gray galvannealed steel + plated copper parts.

Also available in 150 ampere, C150-SE—List price $18.25 same cabinet and terminals as C200-SE.

C200-SE
Showing two methods of by-pass. Link jumper on right side, lead-type jumper on left side.

EXTRA HEAVY DUTY C200-SE

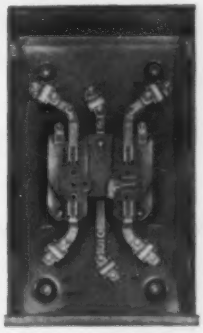
All busbars are copper (plated). Busbar size ½" x ¼" Cabinets are galvannealed steel or 12 gauge aluminum (.081).

Terminals take up to 4/o wire. Terminals are reinforced to carry 200 amp.+

Air space (1½") behind terminal block to carry off heat and keep moisture away from meter.

By-pass will carry full load when testing feed and distribution centers.

Cabinet . . . 17 x 10 x 4 block . . . time tested porcelain Neutral . . . terminals on top and/or bottom of cabinet. Wire can enter from any angle. Design insures absolute weather protection.

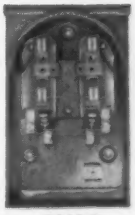


CODE SOCKET METER MOUNTINGS

Meter can be removed, tested, or additional mountings may be added with no interruption of customer's service.

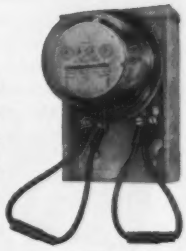
C-100-G2

By-pass for removal or testing without disrupting customer service. Threaded terminals to attach jumpers on all Code meter mountings.



C100-S

For temporary disconnecting or testing, load side can be disconnected without removing meter.



C100-TO

We manufacture a complete line of indoor meter connection boxes, "A" type mountings, Polyphase meter cabinets, as well as many types of special meter mountings and meter connection blocks.

All meter mountings manufactured under Morgan J. Lewis Patent-Numbers 2,548,540, 2,582,638, 2,592,299, 2,691,693 and other Patents and Patent Applications.

WE INVITE YOUR INQUIRIES FOR—Further information, Literature, or Samples

TRADE MARK CODE
ELECTRIC SWITCHES AND EQUIPMENT

THE CODE PRODUCTS CORPORATION

4566 BAKER STREET, PHILADELPHIA 27, PA.

STEEL

Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Plants at: New York • Philadelphia Boston • Wallingford, Conn. • Charlotte, N. C. • Cincinnati • Cleveland Detroit • Pittsburgh • Buffalo • Chicago Milwaukee • St. Louis • Los Angeles San Francisco • Spokane • Seattle

Douglas, Ariz., Gets OK for New Street Lighting

The town of Douglas, Ariz., has authorized Arizona Public Service Co to proceed with a $100,000 street lighting program to be completed by late summer. The result will be seven times more light.

New mercury vapor lights of 20,000 lumen size will be mounted on steel standards replacing present incandescent lights of 6,000 lumens.

Residential lighting, now 1,000-lumen type, will be replaced with 6,000 lumen lamps. Alley lighting will be stepped up from 600 lumens to 2,500. In the business district where mercury vapor lights will not be used new incandescent type lights of 10,000 lumens will be installed.

In all, 119 new lights will be added to the present system, new and replacement lamps totaling 464.

Consumers Power to Aid Engineering Students

Shortage of engineering teachers caused by lure of higher paying posts in industry has prompted Consumers Power Co, Jackson, Mich., to set up a scholarship fund which will primarily aid students who intend to teach engineering.

College freshmen at each of 18 Michigan institutions will receive $200 grants, engineering sophomores at five schools will each get $650 a year for three years, and two graduates seeking doctorates in teaching engineering will receive a maximum of $2,000 a year for three years.

By 1959 Consumers expects to contribute annually to the education of 39 college and university students.

SHAW-PERKINS COOLING RADIATORS

. . . properly designed to cool power and distribution transformers

Designed and built by the pioneers and specialists in economical, dependable self-cooling methods. Sizes and models for any make transformer. Valves, flanges, elbows available. Transformer tanks built to customer's design.

Write for full information. SP-11

MANUFACTURED BY

SHAW-PERKINS

201 EAST CARSON ST. • PITTSBURGH 19, PA.

METER DEVICES COMPANY

1001 Prospect Ave. S.W.

CANTON, 6, OHIO

1 / 52 nd

. . . of the reason why there's only one basic reference in the electric power field is in your hands right now. Over 25,000 men like yourself find Electrical World helps them do a better job. Make the most of it!

SPECIFY

Grip-Tite

EXPANDING ANCHORS

GRIP-TITE MANUFACTURING CO.

WINTERSET, IOWA

"Pioneers in the Anchor Field"

IN CANADA: LINE AND CABLE ACCESSORIES, LTD. • TORONTO

INTERNATIONAL 4-wheel-drive-trucks

Built to go where roads aren't... all-truck built to save you the BIG money!

INTERNATIONAL 4 x 4 trucks are available with factory-installed pickup, stake, panel, Travellall® and dump bodies on a variety of wheelbases. This model S-140 (4 x 4), 11,000 lbs. GVW, has optional Service-Utility body, 2-speed transfer case and 4-speed transmission for eight speeds forward, two reverse.

There's a truck for every public utility need in the INTERNATIONAL Truck line. And in this widespread array of trucks you will find four-wheel-drive models that are right down the alley of public utility service requirements.

These new 4x4s are built to take service crews anywhere, on- or off-the-highway, have power take-offs on transmission and transfer case for auxiliary equipment operation, equipment options for every need. Offered in three sizes—7,000, 11,000 and 15,000 pounds GVW, every one is a standard model, every one is *full size*, with *full size* body, full size Comfo-Vision cab.

Here are trucks that combine "go anywhere" ability with practical, clean-lined money-saving styling—trucks that are heavy-duty engineered for peak four-wheel-drive performance—trucks that are *all-truck*, with no passenger car engines or components asked to do a truck job, for longest life, BIG money savings in operation and maintenance. Ask your INTERNATIONAL Truck Dealer or Branch to give you all the INTERNATIONAL 4 x 4 truck facts.

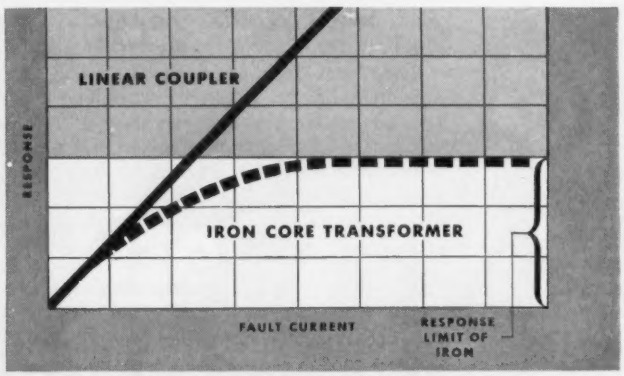
INTERNATIONAL HARVESTER COMPANY • CHICAGO

INTERNATIONAL® TRUCKS

All-Truck Built to save you the BIG money!

Motor Trucks • Crawler Tractors • Industrial Power • McCormick® Farm Equipment and Farmall® Tractors

Francis Irish, System Operations Superintendent, Arizona Public Service Company, checks linear-coupler installation which provides protection for 12.5 and 69-kv bus structure.



Accurate, Dependable—Linear-coupler system has no iron-core transformer, saturation is eliminated. Air-core transformer assures you quick, accurate internal fault indication.

Saturation-Free Linear-Coupler System . . .

Air-Core Transformer Improves Bus Protection

System expansion, plus interconnection of systems, makes it imperative that reliable, high-speed bus fault protection be provided against lightning, interference and breakdown of insulation. For this purpose, a Westinghouse linear-coupler system offers two big advantages.

Simplicity

There is no saturation because there is no iron. The air-core transformer does not saturate, gives consistently true internal fault indication, assures dependable operation of relay and tripping of circuit breaker.

Linear couplers may be open circuited with complete safety without endangering personnel. Operating voltage of coupler is well within insulation limits of connected apparatus. Result: The most reliable scheme for protecting vital bus systems—using simple, compact, low-cost equipment.

Flexibility

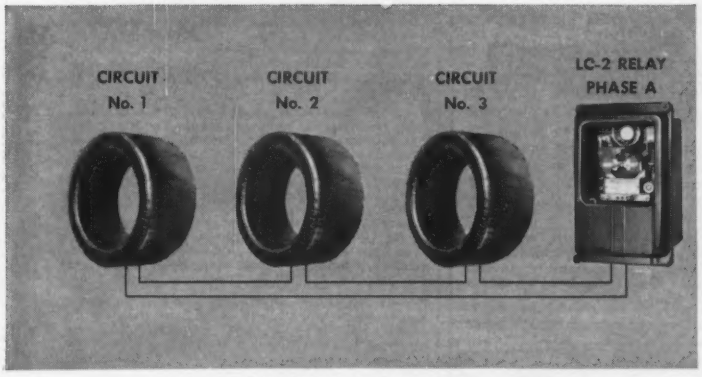
Design flexibility permits couplers to be applied in circuit-breaker bushing pockets, in metal-clad switchgear or on existing outdoor bus work.

Maximum flexibility for system expansion is also assured. As a system grows and more bus sections are added, additional linear couplers require only a change in relay setting achieved simply by changing the impedance tap. Coupler designs for switchgear of 15 kv through 230 kv are available.

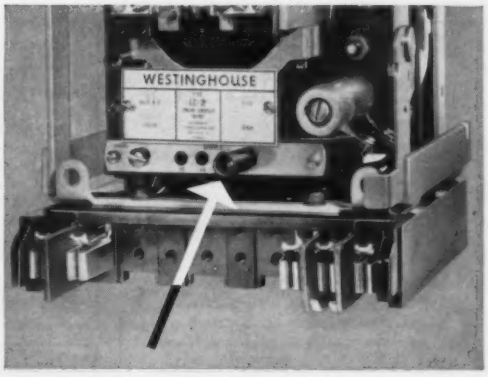
Be sure to investigate linear-coupler systems for your operation. Call your Westinghouse sales engineer or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40488

YOU CAN BE SURE... IF IT'S

Westinghouse



System Simplified—Only one relay per phase is needed with this series connection. Expansion of system requiring additional couplers involves easy calculation for relay setting. Sum of voltages on coupler secondaries indicates relay setting.



Adjusts To System Growth—As system grows, additional linear couplers are installed without extensive recalibration or complicated resetting of relay—simple adjustment is made by changing impedance tap selector screw (arrow).

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Services
Labor Bureaus

DISPLAYED —RATES— **UNDISPLAYED**

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to ELECTRICAL WORLD, 330 W. 42nd St., N. Y. 36, N. Y., for March 19th issue closing March 9th

ELECTRICAL ENGINEERS

SENIOR—ASSISTANT and JUNIOR ENGINEERS—COLLEGE GRADUATES

Electrical Design—
Public Utility Power Plants—
Distribution & Transmissions Systems

ELECTRICAL PLANNING ENGINEERS—SENIOR & ASSISTANT—Strong background and experience in power system planning and economic studies.

ELECTRIC POWER STATION RELAY & APPLICATION ENGINEER—At least 5 years experience—preparation design and specifications of relay protection for power systems. Also for short circuit, power flow and stability studies. Knowledge of d-c and a-c network analyzer, operation and symmetrical components helpful.

ELECTRICAL ENGINEERS—SENIOR—At least 10 years design experience in steam or hydro plants and transmission substations. Knowledge of operation and construction desirable.

ELECTRICAL ENGINEERS—JUNIOR—Minimum 2 years experience—for electrical design of power stations and substations. Also for general analytical work on relay, short circuit calculations and economic studies.

ELECTRICAL DISTRIBUTION ENGINEER—General experience utility distribution work and studies.

Location New York—with established service organization for large group of utilities. Reply stating age, education, experience, personal particulars and salary expected.

AMERICAN & FOREIGN POWER COMPANY INC. and SUBSIDIARIES
2 Rector St., New York 6, New York
21st Floor

STREET LIGHTING ENGINEERING SALES

Midwest mfr. is seeking experienced street lighting engineer for work in product development and technical sales. Must be willing to travel approx. 50% of time. Actual experience in street light engineering and sales is a requirement for this position. Salary commensurate with experience. This is an excellent opportunity for a qualified man. Please submit complete résumé and photograph. All replies will be considered confidential.

P-9457, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

INSTRUMENTATION ENGINEER

A large multi-plant manufacturer of Breakfast Foods, located in a pleasant Southern Michigan city, has permanent opening in their Central Engineering Department for a young graduate engineer.

Duties include design of Process Control Systems, application of instruments and controls, supervising installation and preliminary operations, and working with Plant Engineering Department on operation problems.

Proven leadership qualities, and sound work methods are necessary assets.

This position will offer you a starting salary in line with your experience and ability, an opportunity for future growth, above average benefit program including an outstanding Profit Sharing Savings & Retirement Plan, and a fine community for your family.

Send complete resume to

P-9460, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

TRANSFORMER ENGINEER

Major manufacturer of distribution transformers desires experienced Design & Development Engineer for permanent position. Merit increases, profit sharing, Group Insurance plus excellent opportunities for advancement. Write giving complete resume of education, experience, and minimum salary expected. All applications treated confidentially.

LINE MATERIAL COMPANY
A Division of McGraw Electric Co.
Transformer Plant
ZANESVILLE, OHIO

CHIEF POWER ENGINEER

Must be qualified to supervise about 20 men on all problems related to electrical distribution and power plant equipment for a corrugated board paper pulp mill. Location: Midwest. B.S. E.E. and/or equivalent in experience. CONFIDENTIAL. NO OBLIGATION. State acceptable starting salary. *A top opportunity.*

Send detailed resume to C. R. Logsdon Co., Personnel Consultants to Paper Industry, 19 W. Jackson Blvd., Chicago 4, Ill. Refer to position number J-8917.

When Answering
BOX NUMBERS . . .

to expedite the handling of your correspondence and avoid confusion, please do not address a single reply to more than one individual box number. Be sure to address separate replies for each advertisement.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Efficiency Engineer—Graduate engineer with at least two years' utility operating experience and basic knowledge of utility accounting functions. Will work directly under direction of Vice President in analysis of property operation. Must be free to travel 75% of time. Submit complete resume and starting salary desired. P-9068, Electrical World.

3—Junior Sales Engineers or Sales Trainees by a New Jersey Electric Utility—for commercial air conditioning and refrigeration, power sales and heat pump sales contact work. Age 25-35. Technical education or equivalent. Some experience desirable. Reply stating age, education, experience, personal particulars and minimum salary expected; also, enclose recent photograph. P-9250, Electrical World.

Distribution Engineer, experienced in line design, line and transformer loading studies, voltage conversion projects and street lighting. Experience in substation design and construction desirable but not essential. Location—Pacific Northwest, in utility serving 50,000 customers. Salary—$475 to $550 per month, depending on experience and ability. When replying, give complete resume of education, experience, and when available. P-9538, Electrical World.

A well known Mid-Western Concern offers excellent opportunity for engineer capable of completely designing incandescent, mercury, and fluorescent street lighting luminaires. Your reply with complete qualifications will be held confidential. P-9436, Electrical World.

SELLING OPPORTUNITY OFFERED

Established agency needs sales engineer. Power transformers and high voltage switches, Metropolitan N. Y. area. Permanent, experienced only. SW-9357, Electrical World.

EMPLOYMENT SERVICES

Salaried Personnel, $5,000-$30,000. This Confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

Salaried Positions $5,000 to $35,000. We offer the original personal employment service (established 46 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 558 Brisbane Bldg., Buffalo, N. Y.

POSITIONS WANTED

System Operator—load dispatcher 20 years experience. PW-9351, Electrical World.

Power Engineer—Thirteen years experience in plants up to 100,000 K.W. capacity. Technical education, 29 years of age. Seeks responsible position. PW-9387, Electrical World.

SELLING OPPORTUNITY WANTED

Electrical Manufacturers agent North and South Carolina, calling on distributor, industrial and OEM accounts, warehouse, office staff, 2 salesmen on road. Desire affiliation with live accounts this area. Commission basis only. RA-8731, Electrical World.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

SEND NEW ADVERTISEMENTS TO: 330 West 42 ST., N. Y., for March 19th issue closing March 9th

— WANTED — METERS

Any Quantity

For Sale: Recording Ammeters and standards

ATLANTIC
Electric Meter Corp.
214 E. 41 St., New York 17, N. Y.
OXford 7-0574

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Offices:

Houston— Walnut 3-4580
Los Angeles— ANgeles 3-5148

FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL Wire and Cable Co.
2664M N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

MOTORS · GENERATORS TRANSFORMERS

NEW · REBUILT

WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT CO.

PHONE STATION COLLECT GL 6783
P.O. BOX 51 ROCHESTER 1, NEW YORK

PERIODICALS

Motor Winding Data. Introductory selection 275 single and three phase motors. $1.10. Motor Service, Box 7631D, Kansas City 28, Mo.

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4638) will be received at Denver, Colorado, until March 29, 1956, for furnishing one 10,500-kvar, outdoor, power shunt capacitor equipment, suitable for a 69,000-volt, 3-phase, 60-cycle circuit, consisting of capacitor units, supporting structure, buses, fuses, and discharge devices, for Grand Forks Substation, Missouri River Basin Project, North Dakota. Delivery is desired within 315 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical World can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

TRANSFORMERS

FOR SALE

3—1000 KVA Mol. 11500-2400/4160Y
3— 500 KVA W-H 33000-2300/2400
3— 500 KVA G-E 22000-2300/4000Y
3— 333 KVA W-H 33000-7200/12470Y
3— 333 KVA A-Ch 13800-240/480
3— 333 KVA G-E 7200/12470Y-2400/4160Y
3— 250 KVA G-E 2415/2300-800
6— 200 KVA G-E 13200-2400/2300
6— 200 KVA G-E 13200-230/460
1—1500 KVA W-H 34500-2400/4160Y 3-ph., with substation equip't

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

FOR SALE

Eight Condit Type "08" CIRCUIT BREAKERS

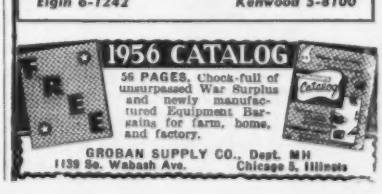
7500 Volt, 400 Amps., 50,000 KVA Rating on a CO-2 min-CO Duty Cycle. Manufactured 1936. In Good Operating Condition. If interested contact N. C. Stirewalt, V.P., Central Illinois Public Service Company, Springfield, Illinois.

$100,000 NEW ELECTRICAL SURPLUS SALE

30,000 Ft., 1½", rigid galvanized Steel Conduit @ .26¢ Ft.
60,000 Ft., new Control, Power, V.C., R.R. Cable & Wire.
Burndy, Appleton, T. & B., G. E., Westinghouse, Switches etc., in factory cases.

All priced below Distributors cost.
Catalogue, price list sent on request.

MIDWEST ELECTRICAL SALES
24200 Telegraph Road Detroit 19, Mich.
Elgin 6-1242 *Kenwood 5-8100*


FREE
1956 CATALOG
56 PAGES, Chock-full of unsurpassed War Surplus and newly manufactured Equipment Bargains for farm, home, and factory.
GROBAN SUPPLY CO., Dept. MH
1139 So. Wabash Ave. Chicago 5, Illinois

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
3	1000	Mol.	110,000—460
1	3750	West.	69000—14400, 3 ph.
4	2500	Mol.	66000—13800
3	1500	G.E.	66000—2400/4160
3	500	West.	69000—7620/13200 Y
3	200	Pitts.	66000—2300
3	1500	Wag.	44000—6900/11950
3	1250	A.C.	44000/11500—460
3	200	West.	44000—480
3	75	West.	44000—7200/12470Y
3	5000	G.E.	38100/66000—6600
1	3750	Penna.	38030/65865Y—13800, 3 ph.
4	3333	G.E.	38100/66000Y—33000
4	3125	Mol.	39000/66000Y—26400/46000Y
3	3333	G.E.	33000/11000—2400/7200
1	3000	A.C.	34500—2400/7200/12470 Y, 3 ph.
2	3000	Stand.	33000—4160, 3 ph.
1	2500	A.C.	34500—13800, 3 ph.
1	2000	Kuhl.	33000—6900, 3 ph.
3	667	A.C.	35000—2400/4160 Y
3	200	A.C.	34500—2400/7200/12470Y
3	200	G.E.	34500—120/240
3	75	Wag.	33000—240/480
2	3750	G.E.	26400—4360/2520, 3 ph.
3	400	G.E.	26400—2400
4	1500	A.C.	25400/44000Y—6900/13800
3	333	G.E.	22800/13200—2400
3	100	G.E.	22000—7200/12470 Y
3	50	G.E.	22000—2300
2	3000	G.E.	13800—600, 3 ph. Unit Sub.
3	1200	West.	13800—600, 3 ph. Unit Sub.
1	1000	West.	13200—2300, 3 ph. Unit Sub.
1	1000	Stand.	13200—2300, 3 ph.
1	450	Penna.	13200—2400, 3 ph. ASKAREL
3	200	G.E.	13200—2400
3	125	A.C.	6900—2300
3	50	G.E.	4800/2400—240/480
3	333	G.E.	2400/4160Y—460
3	200	West.	2400—240/480
3	150	West.	2400—230/115
3	100	G.E.	2400/4160—120/240
1	100	G.E.	2300—575, 3 ph.
6	50	West.	2400—114/228, Dry Type

ALSO:—FREQUENCY CHANGERS
MOTOR GENERATOR SETS
SYN. CONDENSERS
OIL CIRCUIT BREAKERS
FEEDER REGULATORS, ETC.

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

DIESEL ELECTRIC POWER

Stationary—Portable—Mobile

100 KW to 1500 KW

Engineered Diesel Power

"Union Light & Power Company" Cube.

A. G. SCHOONMAKER COMPANY, INC.
Box 516 Sausalito, Cal. 50 Church St. New York 7, N. Y.

LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?

BELYEA COMPANY INC.
51 Howell St. Jersey City, N. J.

PLANS ...for a Free America!
TRUTH ...will keep us FREE!
...and FREEDOM ...go hand in hand!
WINGS... ...for a Free America!
ENGINEERING looks ahead... ...to keep us Free!
FLORIDA POWER & LIGHT COMPANY
Our HEALTH... ...is in free hands!
FREEDOM'S first line of defense... ...our free press!
the RETAIL MERCHANTS ...are free to supply America's Growing Needs!
the BANK WITH CONFIDENCE IN A FREE AMERICA
TRANSPORTATION
INSURANCE for AMERICA'S FUTURE...
A SALUTE TO LABOR!
THEY BUILD
...a firm foundation for America's Better Living!
for WORDS
...we freely speak!
FLORIDA POWER & LIGHT COMPANY

Florida P&L Ads Win Award

Florida Power & Light Co has been awarded the George Washington Honor Medal, presented annually by the Freedoms Foundation for advertising dedicated to maintaining the American way of life. It is the top award in its category—state and local advertising—and is one of 36 given in different categories.

Judging was by a distinguished 30-member awards jury composed of state supreme court jurists, and executive officers of national veterans, patriotic and service club organizations. Malcolm B. McDonald, vice president in charge of advertising who formulated the series, accepted the award for FP&L.

For more than a year the monthly advertisements have appeared in Florida newspapers and magazines, creating keen interest among many groups and building goodwill for the utility.

Motivation for the campaign was the fact that America's highly successful free enterprise system brings benefits to all. It was pointed out to a specific group each month how well they are faring under the American way and how the same fundamental principles are contributing to their enjoyment of better and easier living, electrically.

Such words as "inventiveness," "initiative," and "enterprise" were used liberally to impress subtly that the cited accomplishments were achieved in the classic American fashion without hampering restrictions and bureaucratic control.

The montage of advertisements (above) shows some of the groups at which advertising was directed. In each ad a parallel was drawn with the free enterprise system that has enabled the electric utilities to build the best power system in the world. The local Florida situation was also tied in to each ad with items pointing up FP&L's expansion program.

To insure maximum effectiveness of the program, mailings of reprints were used extensively as the ads were published. As a result, many large groups voluntarily circulated the ad throughout their membership.

Numerous letters were received from community leaders expressing gratitude for recognition in the ads. The ads were also reprinted in FP&L's company magazine.

Summing up the over-all objective, McDonald said, "All of us tend to take our American rights for granted. In our industry, apathy can be dangerous. We hoped these institutional type of ads would show large numbers of people how private enterprise benefits us all. The appeal was made through their own interests, with the hope of strengthening their understanding of the advantages of free enterprise, to the country as a whole and to themselves as individuals."

Annual Reports Reflect Increased PR Interest

Annual report time is here again and early arrivals reflect not only increasing attention to public relations and advertising but also an increasing awareness of benefits to be gained from community development activities.

Cincinnati Gas & Electric Co last year renewed its national campaign to attract industry after a three-year lapse. In the new campaign ads are being placed in Time, The Wall Street Journal, and The New York Times.

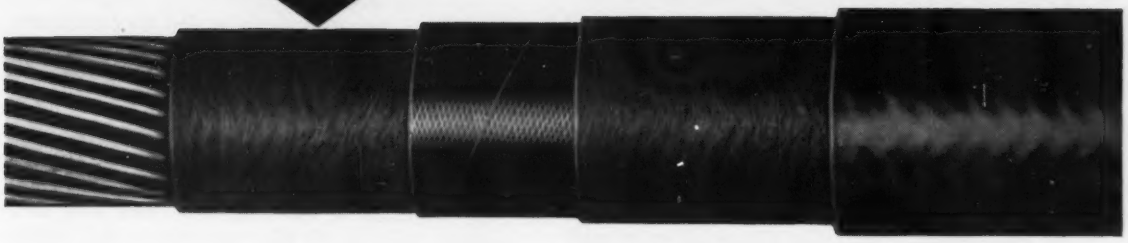
Wisconsin Public Service Corp gained good results with its "Farm Scholarship Essay Contest" and its "Trees for Tomorrow" conservation camp.

The back cover of Niagara Mohawk Power Corp's report carries samples of national ads used in the company's campaign launched in 1955 to promote its area for new business and commerce.

Florida Power Corp believes its community development activity is "one of the finest public relations methods" it has yet employed. It plans increase this year in all public relations activities.

Look beneath the braid

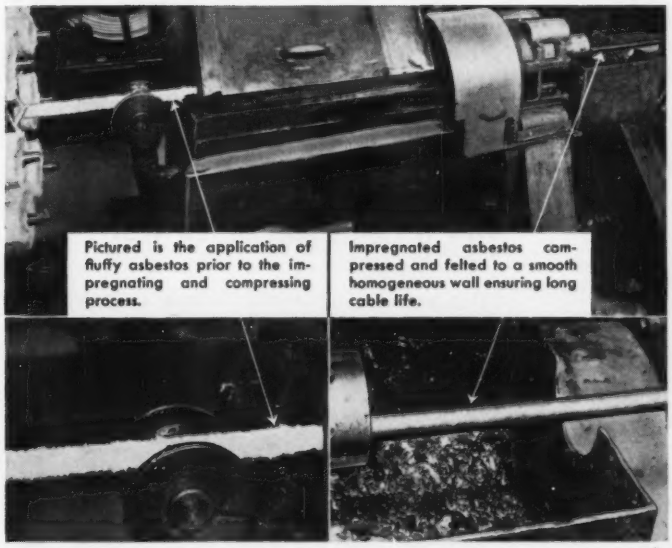
...that's where quality begins



these service proved felted asbestos walls insure uninterrupted operation with

ROCKBESTOS A. V. C.®

(N.E.C. Type AVA)



Pictured is the application of fluffy asbestos prior to the impregnating and compressing process.

Impregnated asbestos compressed and felted to a smooth homogeneous wall ensuring long cable life.

There's a reason why Rockbestos A.V.C. (N.E.C. Type AVA) gives such outstanding service in industry. It is the uniform, dense, felted asbestos walls which have been thoroughly impregnated with selected compounds and firmly compressed without laps, seams or joints to make them resistant to heat and moisture. Felted asbestos walls seal the varnished cambric tapes away from heat and moisture . . . keep dielectric strength high . . . add strength and protection against damage from flexing.

Because of felted asbestos wall construction you benefit with trouble-free, uninterrupted service under conditions such as high ambient temperature, overloads, exposure to heat, oil, grease, corrosive fumes and exposure to moisture.

Complete construction and test specifications of Rockbestos A.V.C. (N.E.C. Type AVA) are in the new booklet: "Specification RSS-88."

Write for your free copy.

ROCKBESTOS
PRODUCTS CORP.
NEW HAVEN 4, CONN.

NEW YORK • CLEVELAND • DETROIT • CHICAGO
PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA

STOCKED COAST TO COAST
Standard Rockbestos A.V.C. construction (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

READERS FORUM

Ohio Edison Total on High Side

To the Editor:

There is an error in the tabulation on page 172 of your Jan. 23 issue with respect to the totals for Ohio Edison Co and Pennsylvania Power Co.

The figures shown independently for Pennsylvania Power Co are correct, and the figures shown independently for Ohio Edison Co are correct in all columns. However, when the figures for the two companies were added together, the steam capacity figures for Ohio Edison Co was doubled from 1,450,350 kw to 2,900,700 kw, and the hydro figure for Ohio Edison Co was doubled from 1,950 kw to 3,900 kw. To the sum of these two erroneous figures was added the correct figure of 155,000 kw for Pennsylvania Power Co, thus winding up with the figure shown at the bottom of the page of 3,059,600 kw. The correct total figure for the entire two companies should have been 1,607,300 kw.

John C. Costello
Assistant to the President

Ohio Edison Co
Akron, Ohio

• The editors regret that this mixup in figures got into print. It is hoped that the error will not inconvenience anyone concerned.

Are You Being Misrepresented?

To the Editor:

Public power ownership advocates are most always funny; but when they undertake to justify their schemes and propagandize the readers of Electrical World, they are funniest of all. One has only to glance at the article by Mr Marshall (EW, Jan. 23, p 290) to note the fallacy of his arguments. No doubt privately owned utility companies could pay off all the investments of their stockholders if they were free of taxes and interest charges, as TVA was when it accumulated the $300 million "profits" he mentions. Or if his friends paid comparable taxes, instead of the 4.5% he mentions, it is obvious that their "16.1% Net Earnings" would go glimmering.

However, one cannot be too much surprised by the enthusiasm of the people living in the areas benefitted by billions of dollars of the taxpayers' money the Congress of the United States has "donated" to those areas. It is purely a pork-barrel grab by the politicians representing those areas, and it is human nature to accept presents and vote for the guy who procured them for you. However, the astonishing thing is that most of the members of Congress who help to put over these grandiose schemes do not live in the benefitted areas and do not receive any votes from the beneficiaries there. Their constituents live in other areas and have to foot the bills although they receive none of the benefits. They are not "preference" customers—just taxpayers.

Just what prompts a member of Congress from the Atlantic area to vote to burden his constituents with taxes to enable somebody in Tennessee or on the Pacific coast to buy something at a lower price than his folks at home have to pay? Isn't it about time the taxpayers delve into the mental processes of their mis-representatives in Congress to see just what makes them tick? If the majority of them had been interested in the welfare of their own constituents, there would have been no so-called public power installations. Better ask your Congressman whether he is representing you or some far remote group of people who are probably just as able as you are to pay a fair unsubsidized price for their electrical service. Remind him that he did not run on the Socialist ticket. There never was any justification for TVA, BPA, or any of the other tax grabbing electric power projects.

Hunter T. Wilson

Huntington, W. Va.

• Undoubtedly the indifference of the average American as to what is going on in Washington is responsible.

Watt a Contribution? Eh Watt!

To the Editor:

If it is not too late to toss in another contribution with reference to your editorial of some months ago, "Give Us a Hand on Terminology," I would like to submit this eight-watt suggestion.

You often wonder-watt to call
the willing-watt and all
the wiring-watt it takes
to banish skimpy-watt . . .
So maybe "ADEQ-WATT" could be
the wiring slogan-watt people should see
So reddy-watt eternally
is plenty-watt!

Or, referring to the "housepower" that you have publicized recently and that is to be promoted, how about "ADEQ-WATT HOUSEPOWER?"

S. P. Bordeau
Manager, Advertising & Technical Publication Department

Electric Machinery Mfg Co
Minneapolis 13, Minn.

Modernize Distribution Systems

with SORGEL Air-Cooled Transformers

Increase feeder capacity by transmitting electric power to interior load centers at higher voltages

The Most Practical Type Transformers to Step Down Voltages at Load Centers

Air-cooled dry-type transformers are the most practical type for indoor installations, and it is important that the transformers are of the best quality—SORGEL transformers. They require little or no maintenance; no liquid to check or replenish; no fire hazard; small and compact; economical; easy and convenient to install; no vault required.

Increased Efficiency

Because SORGEL transformers can be installed close to load centers, the result is shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Easy and Low Cost Installation

All self-contained in a single unit—either single phase or 3-phase—with simple connections to make. No separate mounting brackets or junction boxes to make or buy. Substantial wall brackets, with slots for bolts, or floor mounting base, are an integral part of Sorgel transformers. Roomy connection compartment with wide choice of knockouts. All transformers are equipped with solderless terminal lugs and permanent connection diagram.

Quiet Operation

The sound level of SORGEL transformers is well below the established standards. This outstanding feature is appreciated where low sound levels are an important factor. For that reason they are particularly adaptable for indoor installations close to load centers.

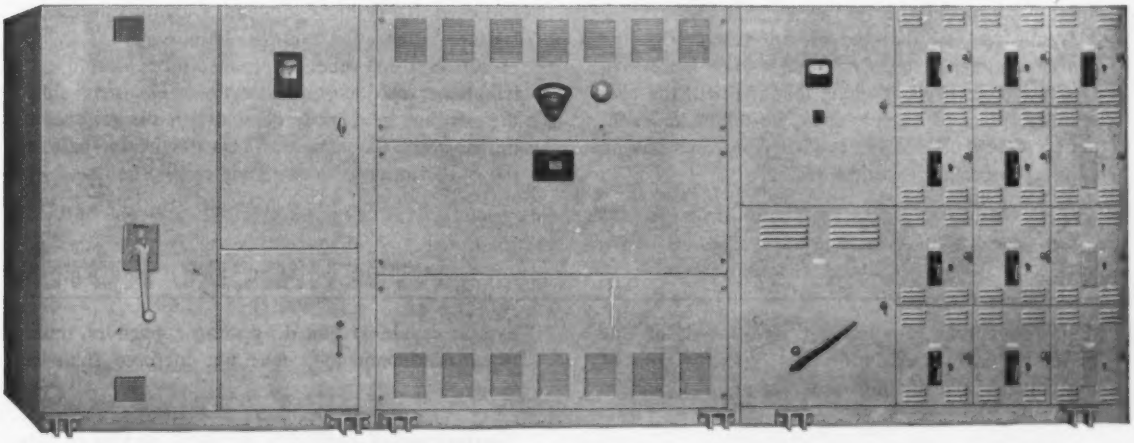
Large Variety for Every Purpose

These transformers are available in a large variety of sizes and types for every purpose. ¼ Kva to 2500 Kva single phase. 1 Kva to 3000 Kva 3-phase. All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltages.

1 to 10 Kva, 3-phase

A Perfect Partner for Substations

Sorgel transformers, either dry-type or Askarel-cooled, can also be incorporated in substations, complete with primary and secondary switchgear. They are procurable with any make of switchgear, and from any substation manufacturer.



Unit substation, with primary switchgear—metering—2000 Kva 3-phase, 13,200 volt transformer—secondary circuit protection. Shipped completely assembled, wired and tested, ready to connect to lines. Nothing else to buy, make, or assemble.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wisconsin

WASHINGTON COMMENT

More Adequate Atomic Insurance Needed

Program offered by underwriting companies is not sufficient to cover risks involved, say utility executives. Congressional committee seeking solution

The nation's civilian nuclear power reactor program may bog down unless something is done quickly to lighten the burden of risk of those sponsoring the program's development.

That's what several utilities leaders engaged in the atomic power program say. They turn thumbs down on offers of the insurance industry to underwrite $60 million in public liability for each atomic plant.

Willis Gale, chairman of Commonwealth Edison Co of Chicago, a $700-million electric utility system associated with six other utilities and a construction company in one of the nation's largest reactor experiments, puts it this way:

Must Have Insurance at Reasonable Cost

"Our proposal to the (Atomic Energy) Commission and our contract with General Electric Co (for a $45-million reactor) are conditioned upon the satisfactory solution of the insurance problem, at a reasonable annual cost, before the end of 1957."

Gale is fully acquainted with the insurance companies' offer.

So is William Webster, president of Yankee Atomic Electric Co, an organization of 12 New England utilities now backing a $40-million nuclear plant. Webster says:

"While we feel that the present capacity of the insurance industry to cover these risks is more than adequate to justify our going forward with the preliminary stages of our program, we doubt that adequate protection yet exists to justify our undertaking major construction expenditures."

Some differ with this view. Consolidated Edison Co of New York, for instance, has long believed a satisfactory solution to the insurance question would be worked out before the company gets its 140,000-kw reactor working, about 1960. Con Ed is quietly going ahead with preliminary design and engineering work, apparently quite unmoved by the comments.

Congressional Group to Run "Seminar"

The Atomic Energy Commission and Congress were satisfied with the promised insurance company coverage until Gale and Webster spoke up. AEC Licensing Chief Harold Price had characterized the insurance companies' offer as "substantial" and "in excess of amounts offered other industries." Members of the Joint Congressional Committee on Atomic Energy had seemed reassured.

Now, the committee is unsure. Instead of winding up its hearings on AEC's progress under the 1954 Atomic Energy Act, the joint committee scheduled an insurance "seminar" for three weeks hence. No agenda has been set, but committee members apparently feel the insurance problem is so acute that something must be done, and fast.

Whether it be a suggestion for a government-sponsored atomic hazards insurance program, as endorsed by Willis Gale and General Electric, a statutory limitation on the liability of a reactor owner, or some other solution, utilities should contribute toward its determination. They will have their forum in a week or so when the joint committee holds its seminar. They should not pass up the opportunity to take part in it.

TECHNICAL NOTES

Megavoltamperes required per unit length of line for ice melting varies approximately as the cube of line voltage. Ice melting requirements can place a ceiling on transmission voltage.

Optimum installation of shunt capacitors for I^2R reduction on a radial system can be determined with a dc network calculator when board voltage is selected to represent the ratio of ckvar cost differential to twice the product of per unit line resistance and loss per kw.

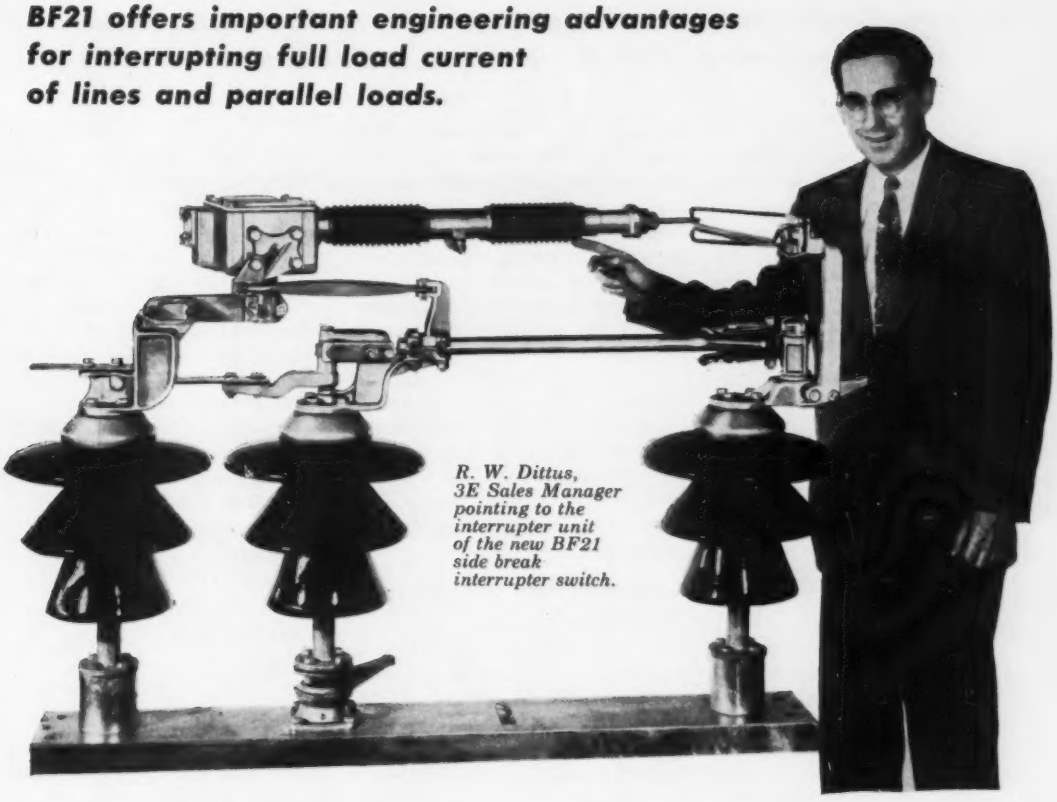
System capability added by shunt capacitors, unlike usual reinforcements, does not increase fault severity.

Thermocouples inserted in the metal backing of babbitted thrust shoes give fast response to thrust-bearing metal temperatures.

Line design, wind, and rain all influence transmission RI and TVI. But wind can have pronounced effect on TVI with little change in RI.

New! 3E Outdoor Interrupter Switch

BF21 offers important engineering advantages for interrupting full load current of lines and parallel loads.



R. W. Dittus, 3E Sales Manager pointing to the interrupter unit of the new BF21 side break interrupter switch.

CONSTANT HIGH SPEED INTERRUPTION

Contact speed is independent of the time taken to operate the switch for both opening and closing. The interrupter unit for each pole of the switch has its own self-contained high speed mechanism.

COMPLETELY CONFINED ARC. Interruption takes place inside the arcing chamber . . . here the arc created by the interruption is confined and extinguished.

FAST CLEAN INTERRUPTION . . . one cycle or less.

DRY TYPE INTERRUPTER UNIT. The arc is interrupted in the arcing chamber by the pressure and effective blast of gases produced by the action of the arc upon solid material enclosed in the arcing chamber, and no oil or air blast is required.

OVERLOAD CAN'T DAMAGE INTERRUPTER UNIT. The interrupter is out of the circuit when the switch is in the closed position.

THE BF 21 outdoor interrupter switch is basically the efficient, simple BF20 side break switch plus the new interrupter unit. The new BF21 is now catalogued in units through 46 K.V.

3E interrupter switches in voltages up to 115 KV have already been installed. As with the rest of 3E's line, we invite your inquiry for special applications.

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS, U.S.A.

Rules on Accelerated Depreciation

South Carolina PSC prescribes normalized taxes and a restricted surplus method of accounting. Order is a revision of that issued on Jan. 27, 1954

The Public Service Commission of South Carolina has issued an order dated Dec. 20 with respect to the accounting treatment of accelerated depreciation to South Carolina Electric & Gas Co, South Carolina Generating Co, and South Carolina Natural Gas Co.

Restricted Surplus Method Used

This order, which prescribed normalized taxes and a restricted surplus method of accounting, drew heavily on the findings of an earlier order of the commission with respect to accelerated amortization.

The commission, in its findings, stated: "that this commission issued its Order E-723 on Jan. 27, 1954, prescribing accounting procedures to be followed in connection with the accelerated amortization of emergency defense facilities for federal income tax purposes under Section 124A of the Internal Revenue Code, and in said order gave recognition to the principle that the purpose of such rapid amortization of the cost of emergency facilities is to defer tax payments to subsequent years rather than to create additional income, and provided in substance (1) that the book provision for depreciation of such property be at rates consistent with those for non-certified property, (2) that current provision be made in the tax expense account for future taxes to the extent of reduced tax requirements during the amortization period, with credits to restricted earned surplus, and (3) that in the post-amortization period until such restricted earned surplus is exhausted or such facilities are retired to offset the increased taxes by credit transfers from the restricted surplus to the tax expense account; and

"That the purpose of Section 167 of the Internal Revenue Code of 1954 which permits accelerated depreciation for federal income tax purposes of property constructed on or after Jan. 1, 1954, is basically similar to the purpose of Code Section 124A, namely, to assist in the financing of the expansion and modernization of facilities by a deferral of taxes rather than to create additional income through a tax saving; and

"That the accounting principles recognized in Order E-723 are appropriate in this proceeding; and (Emphasis supplied)

"That the use by petitioners of such liberalized tax depreciation methods as may be appropriate from time to time will conserve cash in the early years of the service lives of new properties and thus assist in financing construction to meet growing load requirements".

Accounting Plan Outlined

The commission in its order stated: "That petitioners, with respect to depreciation on any of their properties which they elect to subject to accelerated depreciation for federal income tax purposes under Section 167 of the Internal Revenue Code of 1954 and with respect to the tax effects of such election, are hereby authorized and permitted to observe the following accounting procedure:

"(1) To accrue depreciation for that portion of its properties which are the subject of such accelerated depreciation for federal income tax purposes, at rates consistent with those for like property not subject to accelerated depreciation.

"(2) During the years of the service life of any of its properties which are the subject of such accelerated depreciation in which a deferral of federal income taxes results from its use, to charge to a special subdivision of 'Taxes,' as an operating expense, and concurrently to credit to 'Earned Surplus Restricted for Future Federal Taxes on Income—Accelerated Depreciation' amounts in total for each year equal to such deferral of federal income taxes.

"(3) During the years in which with respect to any of its properties so subject, an increase of federal income taxes results from the use of such accelerated depreciation, and continuing until 'Earned Surplus Restricted for Future Federal Taxes on Income —Accelerated Depreciation' applicable to such properties is exhausted, or such properties are retired from service, to charge to 'Earned Surplus Restricted for Future Federal Taxes on Income—Accelerated Depreciation' and to credit to a different special subdivision of 'Taxes,' as a reduction of operating expense, amounts in total for each year equal to such increase in Federal income taxes.

"This Order shall not in any way affect or limit the right, duty of jurisdiction of this commission to further investigate and order revisions, modifications or changes with respect to any provisions of this order in accordance with the law."

Clark County PUD Cuts Rates $345,000 a year

A rate reduction announced for April 1 by Clark County Public Utility District, Vancouver, Wash., is declared to be the largest ever made by a PUD.

The new rate schedule will charge $1.60 for the first 50 kwhrs each month as compared to previous charges of $1.75 in Vancouver and $2.10 in rural areas for the same amount of electric power.

PUD commissioners said that residential customers will be paying 9 to 21% less than customers across the Columbia River in Portland, Ore., while commercial rates will be 9 to 17½% lower than Portland.

The PUD announced the rate reduction after reporting a net income of $886,000 for last year. Savings to customers under the new rate schedule are expected to total around $345,000 annually, the PUD commissioners announced.

P&K ALL-ALUMINUM STANDARDS AND ARMS:

ROOSEVELT BOULEVARD, PHILADELPHIA, WHERE 1,000 NEW LIGHTS ON P & K ALL-ALUMINUM STANDARDS AND ARMS WILL MARK THE LAUNCHING OF PERHAPS THE MOST FAR-SIGHTED STREET LIGHTING PROGRAM OF ALL TIME.

AT THE END OF A 10 YEAR PROGRAM 70,000 STREET LIGHTS WILL HAVE BEEN INSTALLED AND MODERNIZED. ALL POLES, BRACKETS AND LUMINAIRES BEING USED ARE ALUMINUM.

MR. HAROLD E. MASON
Street Lighting Engineer
City of Philadelphia

THE LOGICAL CHOICE IN PHILADELPHIA

Like their 500 P & K predecessors installed in the "World's Workshop" years ago, these new P & K 32-ft. All-Aluminum Standards, and P & K 12-ft. Tapered Elliptical Arms will prove *the wisest investment in modern lighting.*

LIGHT-WEIGHT, HIGH STRENGTH, AND CORROSION-FREE FOR EASY INSTALLATION AND LONGEST LIFE.

NO NEED FOR PROTECTIVE MAINTENANCE, NEVER NEED PAINTING.

NO SEAMS, NO FRILLS, NO SCROLLS, NO TIE-RODS. ITS MODERN SIMPLICITY IS CONTEMPORARY TODAY OR TWENTY YEARS FROM TODAY.

PROVES MUCH LOWER IN COST OVER THE YEARS.

Write for latest P & K catalog . . . and use the P & K advisory and planning services without obligation.

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84 Foundry Street
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FORM "FRS"—Single position table with photo-electric control. Will test single phase and 2 and 3 element polyphase meters.

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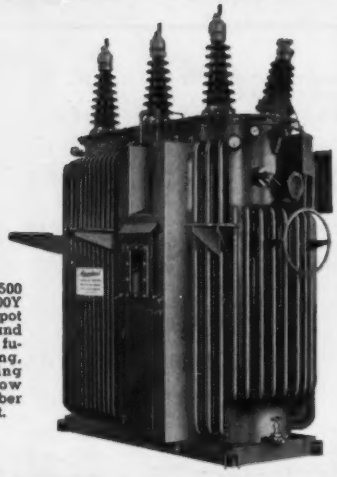
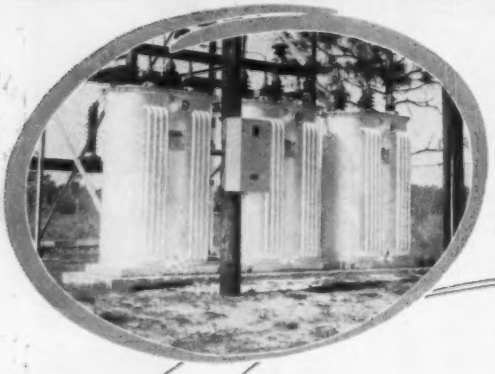
Power transformer, OISC, 2,000 KVA, three phase, 60-cycle, 23,000 to 2,400 volts. Has four 2½% above and four 2½% below high voltage regulating taps with externally operated no load tap changer.

Power transformer, 1,500 KVA, three phase, 69,000Y to 480/240 volts. Hot spot temperature indicator and control, provisions for future forced air cooling, pedestals for mounting lightning arresters, low voltage terminal chamber and gas seal equipment.





When dependability is a factor...

Dependability in a transformer to you means trouble-free performance and long service life. To us, this means dependable construction.

For example, at STANDARD . . .

Tanks are built of rust-resisting steel, arc welded seams and tested under pressure. Liberal clearances are allowed from the windings and leads to tank and cover.

On the outside . . . attractive, long-wearing finishes with a primer coat and two finish coats of blue-gray enamel . . . on the inside, a lining of red oxide.

Covers are carefully and accurately fitted.

Tap changers and accessories efficiently placed with a specially designed tap changer switch.

These are just a few of the construction factors which STANDARD builds into Power Transformers. Look to STANDARD when you want dependability.

Everything Points To...

WRITE FOR BULLETIN CL-50

Tells the story with words and pictures of STANDARD'S complete line of transformers, and how they perform for every class of service . . . on the job.

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THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

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Emergency power source for generating stations and substations

Reserve lead supply in spiral buttons keeps battery young

SWITCHGEAR BATTERY. Exide-Manchex Batteries are available in a wide range of capacities from 8 to 960 ampere hours, with improved high rate discharge characteristics. Compact construction saves space and weight. Flat cover easy to clean. Write for Bulletin No. 4852.

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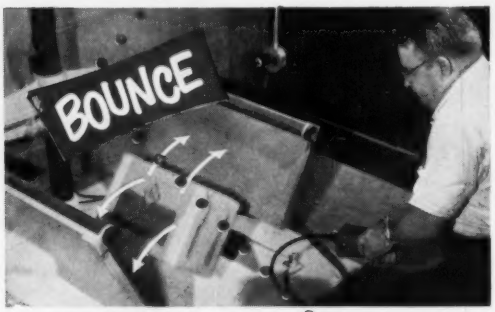
The reason can be found in their unique construction. Exide engineers have cut through the center of an Exide-Manchex positive plate and photographed the results shown above. Under the outer layer of active material on the spiral buttons you can see a shiny core of reserve lead. During the life of the battery, this lead turns slowly to active material as it is needed. Yet the inactive metal grid never, never weakens; always retains its shape; holds the buttons firmly in place. Hence battery life is prolonged.

Only Exide-Manchex Batteries offer this extra assurance of long battery life. When you order batteries for floating service applications—whether with new equipment or for replacement—be sure to specify Exide-Manchex. For information, call the Exide sales office near you. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

NEW Transformer Obstacle Course

On this vibrating table, crated distribution transformers are tested for railroad car and truck vibrations. Equipment simulates varying speeds, irregularities in road or track, and natural frequency of truck springs.



Hinged platform drops packaged instrument transformers to steel plate from various heights. Package is positioned at desired angle of impact to test all edges and faces.

Assures Safe Shipment by Pretesting Package Design

At Allis-Chalmers, quality control doesn't end until the transformer shipment arrives at your door. An example is A-C's *new* equipment for simulating transportation conditions. It has a twofold benefit:

1. Provides information on safe crating and boxing.
2. Produces useful facts on improvement of transformer design.

It's assurance that transportation rigors will not affect transformer performance.

Previously A-C engineers traced test shipments over the country. This was time-consuming, but out of it came important results like A-C's floating load method of shipping transformers in 1952, and the pallet-bonus crate introduced by Allis-Chalmers in 1954.

But now, with this *new* shock-test equipment, results can be had faster and more accurately than before. Now, every newly designed transformer is shock tested in order to check its mechanical strength and prove the design calculations. At the same time, this "road test" checks the crate design for possible improvement.

A-4903

Impact test is equivalent to free drop to ground from back of truck or railroad car. Packaged unit slides down incline from a release point selected to produce impact equivalent to 9 G's . . . nine times acceleration of gravity. Shock recorder on crate measures initial impact.

Look for the seal on A-C transformer shipments which certifies approval by National Safe Transit Committee.

Allis-Chalmers complete package-testing program is just one of many steps A-C takes to produce better distribution transformers. It will pay you to get complete information. Why not call your nearby A-C office today? Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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